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THE WRECKS OF THE SPANISH ARMADA ON THE COAST OF IRELAND.*

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There are points at which history and geography meet, and where history provides material that geography alone can weave into shape. In the case of the destruction of the Spanish Armada by Atlantic seas, chiefly on the west coast of Ireland, the event was of such supreme importance in itself, and occupies such a prominent place in history and in the imagination of the British people, that I may be pardoned if I assume that every detail that can be found out as to the wrecks of the ships is worthy of record. Since the State papers of England, Ireland, Spain, Venice, and the Papal States of the period of Queen Elizabeth have been published, it has been found possible to get at the very sources of the history of the enterprises and intrigues of that brilliant time.

Captain Duro in Spain, and Mr. Froude in England, were probably the first to avail themselves of the Spanish papers of Simancas. The editors of the State papers, especially Major Martin A. S. Hume, have, in their introductions and other writings, done good service in bringing out many details of deep interest, which they were in a specially favourable position to discover.

Other historians, Prof. Laughton, for example, in 'The Defeat of the Spanish Armada,' and Julian Corbett in his 'Drake and the Tudor Navy,' have seized upon the information thus provided, and given to us the result of their investigations. The only reason I can offer for entering the lists on such a subject is, that I may claim to look at the

* Read at the Royal Geographical Society, February 9, 1906.

facts from a slightly different point of view, and if I have been able to see a few things that others have missed, it is simply because I have had special opportunities of studying the geographical side of the question.

In 1890 and 1891 it became my duty to make a special Fishery Survey of the west coast of Ireland. I had to navigate all harbours, channels, and creeks on that coast, and while primarily interested in the present condition of the inhabitants, the traditions of the past that still linger, aroused my interest in the history of the places we frequented, and to which I have many times returned in succeeding years.

There proved to be many interesting events associated with those wild western bays, but none probably of so much general interest as the wrecks of the Armada. Twenty-five ships * appear to have been wrecked on the Irish coast, while others reached safe anchorages on that coast, and were among those that ultimately returned to Spain.

Before taking up the story of these wrecks, we must consider what previous knowledge the Spaniards had of navigation on the Irish coast. That they showed a remarkable amount of knowledge of this kind is, I think, a fact, for they frequently brought their big ships to anchor in exactly the best places. Mr. Froude, who was evidently impressed by this, attributes this successful pilotage to Maurice Fitz-Gerald the titular Earl of Desmond, Fitzmaurice, and some other Irishmen, who were on board. There is nothing to show that any of these gentlemen were navigators. Most probably they were not. The Irish themselves at this time were not given to navigation, though the O'Flahertys and O'Malleys of Connaught were remarkable exceptions to this rule. The fact is, that among the crews of the Spanish ships, besides a few Scotch and Irish pilots, there must have been hundreds of men accustomed for years to take part in the Irish fisheries and Irish trade. In Duro's list of pilots and "experts," almost all the names indicate Italians or Spaniards.

Spanish intercourse with Ireland, of which so many traces still remain, went on for centuries prior to the days of Elizabeth, and, in the years immediately before the sailing of the Armada, the Spaniards on the Irish coast were not only represented by the crews of the six hundred Spanish fishing boats, of which Sir Humphrey Gilbert makes a special report to the queen,† but also in permanent fishing establishments on the coast.

Sir Francis Drake drew up a complete scheme for capturing these trading ships and fishing boats, and he states that the fishing vessels

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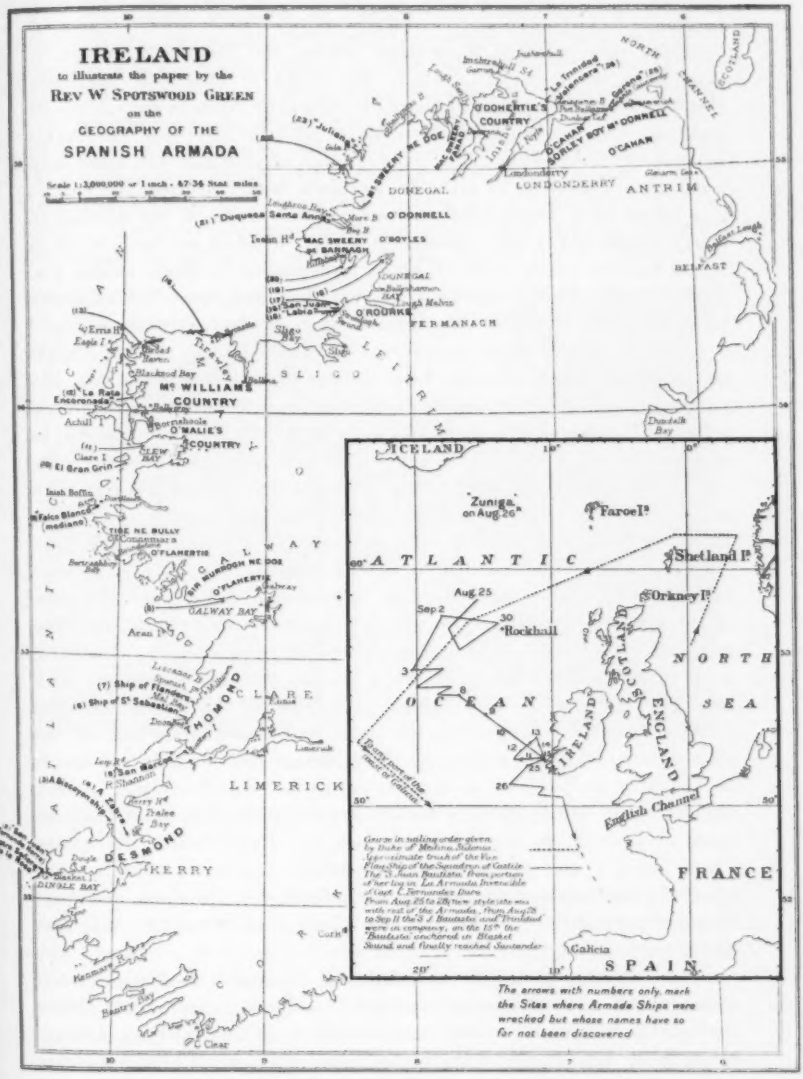
* If the *Hulk* that got into Donegal was lost, the number would be twenty-five (see State Papers, Ireland, 1588–92, p. 64).

† Carew Papers, 1572, p. 422; also ibid., 1580, pp. 285–286.

were each of about 100 tons burthen.* Owing to the prevailing south-



westerly and north-westerly winds, the run to and fro between Spain and the west of Ireland was a comparatively easy voyage for vessels

* State Papers (Spanish), February 7, 1587.

that could wait a little for a fair wind. And the west of Ireland then seemed to be for fishing what the banks of Newfoundland have since become.

From this personal knowledge, which the Spaniards gained by experience, we naturally turn to the maps or charts of the coast. Mercator's charts, published 20 years before the Armada time, are very accurate, and his chart of the eastern Atlantic compares favourably with charts made long after. Other maps of this date and later show great inaccuracies in detail. In Norden's map, published in 1610, a line drawn from Teelin head in Donegal to a berth off the Blaskets in Kerry represents a safe course for a ship to clear all land, while in actual fact the north coast of Mayo, terminating in Eagle island, projects 40 miles to the westward of this line, and, with the exception of Broadhaven, in which one Armada ship was lost, presents a line of precipitous cliffs, with no creek in which a ship could shelter. Eight of the ships known to have been caught by this trap were lost, and possibly others were dashed against the iron-bound Mayo shore, of which no records exist. Even at the present day a ship might well be wrecked on these Mayo cliffs and escape all notice, for, owing to the tops of the cliffs being the highest land and the ground sloping down as you go inland, the very sparse population command no view from their dwellings of what goes on on the sea.

The tales of the few Spaniards who escaped when the ships were lost sometimes show what at first sight seems marvellous ignorance of the places where they were wrecked, and some writers, taking these accounts as accurate, have got into hopeless confusion in attempting to fix the scenes. Many of the survivors were soldiers, who took but little interest in the problems of navigation that the sailors were striving to solve; many of the accounts were passed from men of one ship to men of another before the story became embodied in a despatch to Spain, or to England, as the case might be. In illustration of this, the survivors are frequently found describing any headland from the north of Donegal to the south of Cork as "Cape Clear." Now, Cape Clear, being at the extreme south of Ireland, would not come in sight at all if they followed the sailing directions given to them, and most frequently what they mean by Cape Clear is any headland they first fell in with.

Prior to the period of the Armada, Spaniards had done much towards the advancement of scientific navigation, and many works in Spanish had been written on the subject. Their latitude observations, taken with the cross-staff or astrolabe, seem wonderfully accurate wherever it is possible to check them. Watches had been recently invented, and though their use in obtaining longitude had been suggested, it does not appear that the method had come into general use. Longitude at sea was fixed by combination of dead-reckoning with

latitude observations, but the use of the log was unknown. Great-circle sailing was beginning to be understood. The measurements of distance were sometimes confusing, as leagues may mean anything, from an Italian league (which was 1000 yards) to a league referred to by Flemish captains, which measured fifteen to a degree. The league used by the Spaniards was the same as ours, and the distances mentioned in their logs are generally accurate. For example, one ship of the Armada, having got her latitude by observation, fixed her position by sounding in 125 fathoms on the Rockall bank, and entered her distance from the Irish coast as 95 leagues, which was approximately the distance to Erris Head.* An important correction which has to be considered in reading the narratives, is that the variation of the compass for the British area

NEAR PORTURLIN, AMONG THE CLIFFS OF NORTH MAYO.

in 1588 averaged about 10° E., compared with about 20° W. as it is at present.

When the sun set on Friday, August 3 (Old Style), 1588, the Duke of Medina-Sidonia saw the last of the British fleet. They had escorted him till they were abreast of the Firth of Forth, to make sure that he did not attempt a landing in Scotland.

He had now time to collect his remaining squadrons and issue orders for the long voyage that was before them. A copy of the sailing orders he distributed was found in one of the vessels wrecked in Ireland, and a translation made at the time is still extant. It runs thus—

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* *Relacion de Marcos de Aramburu* in Duro's 'La Armada Invencible.'

"THE COURSE THAT SHALL BE HELD IN THE RETURN OF THIS ARMY INTO SPAIN.

"The course that is first to be held is to the North-North-East, until you be found under 61 degrees and a half: and then to take great heed lest you fall upon the island of Ireland, for fear of the harm that may happen unto you upon that coast.

"Then parting from those Islands, and doubling the Cape in 61 degrees and a half, you shall run West-South-West until you be found under 58 degrees: and from thence to the South-West to the height of 53 degrees: and then to the South-South-West, making to the Cape Finisterre, and so to procure your entrance into the Groyne or to Ferrol, or to any other port of the coast of Galicia." *

It was a very safe course, so far as the Irish coast was concerned, if a long one. The ships were to turn west so as to clear the north of Shetland by 30 miles; to keep north-westward of Rockall, and when altering their course to south-south-west, were to be 360 miles west of Galway. If the course here given was followed, it would not lead to Cape Finisterre at all, but out into the direction of the Azores. There is, however, a very evident error of transcription in the last "leg" of this course. It should read "S.E." not "S.S.W." The Spanish words for east and west are so much alike that the error was easy. These sailing directions were not, however, adhered to, for a British fishing-boat reported the wonderful sight she saw on September 8, as she was returning from Shetland to England—a great fleet of "monstrous great ships, with all sheets aftward" (that is, running before the wind), making for the sound between Fair Isle and Orkney.† The Duke and other officers of the fleet also state that this was the route taken.

Don Baltasar de Zuñiga was landed at Scalloway, in Shetland, on August 10, with despatches for Spain, which he delivered safely.‡

As the fleet passed the Orkneys we may take stock of the number of ships composing it. This has been variously stated as 80 or 100. Both these figures are, I expect, under the mark. The Armada had left Spain 130 strong, but I think Prof. Laughton's statement may be accepted that the number of vessels of all sorts, including despatch boats and *zabras*, that actually entered the English channel was no more than 120, of which seven large ships, the *San Salvador*, *Rosario*,

* State Papers (Ireland), vol. 137, 1.

† Laughton, 'Spanish Armada,' vol. 2, p. 137.

‡ State Papers (Venetian), 1588, document 745.

Santa Ana, *San Lorenzo*, *Maria Juan*,* *San Filipe*, and *San Mateo*, were lost during the days of fighting. The *San Juan de Sicilia* went down in the North sea. The *Falco Blanco* (mayor) was captured when trying to get back through the Channel. The balance of those missing was mostly made up of small craft, one of which at least is known to have gone off to communicate with the Duke of Parma, and did not return.

Taking the number of ships that passed the Orkneys as 100, and allowing that 57 of them got back to Spain, which I think is nearly correct, the result may be stated as follows: The *Gran Grifon*, after taking on board a portion of the crew of the *Barque of Hamburg*, which went down in the Atlantic, put back and was lost on Fair Isle;† 2 ships lost on Scottish coast, the *Florencia*, in Sound of Mull (wreck now being explored),‡ and a vessel called the *San Juan* on the outer Hebrides;§ 25 lost on coast of Ireland; 2 blown by storm into the English channel;‖ 57 returned to Spain; 12 unaccounted for. Result, 100.

Of the twelve unaccounted for, some were probably lost on the out isles of Scotland and of Ireland, while others may have gone down at sea.

Of the ships that passed westwards into the Atlantic, there was the Capitana General, *San Martin*, with the Duke of Medina Sidonia on board; and the *San Juan*, on which went Martinez de Recalde, the Admiral of the Armada.

The Levantine squadron was represented by the *Regazzona*, a ship of 1200 tons and the largest in the fleet; and by others, including *La Trinidad Valencera* and *La Rata Encoronada*. The last ship, specially well-found, was commanded by Don Alonso de Leyva, and with him were many of the noble youths who had come to be present at the invasion of England. On this ship great state was observed, and on the way to the Channel banquets had been given at which the Duke and other high officers of the fleet were present.¶ The *Rata*, too, was one of the hardest of fighters, and was in the thick of every engagement; while her commander, in the opinion of many, should have been the leader of the Armada.

Of the galleasses, the ships with oars worked by hundreds of slaves, there were the *Napolitana*, the *Gerona* and the *Zuñiga*. The remainder of the fleet was made up of galleons, transports, and the smaller craft known as patachos and zabras belonging to various squadrons.

All the ships were now short of water and provisions, though some

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* State Papers (Venetian), 1588, document 746.

† Hume, *Transactions of R. Hist. Society*, vol. 11.

‡ Duke of Argyle in *Pall Mall Magazine*, vol. 36, No. 149, p. 372.

§ Hume, *Trans. R. Hist. Soc.*, vol. 11.

‖ State Papers (Venetian), 1588, No. 765; also (Spanish), p. 462. Laughton, 'Defeat of the Spanish Armada,' vol. 2, p. 386.

¶ 'Harleian Miscellany,' vol. 1, p. 140.

were better off than others. Numbers of men were sick, and the small relief that was gained at Scalloway, from the trading-vessels captured, did little to alter the deplorable state of the crews.

With the wind north-east,* they passed the Orkneys on August 9 and 10, and, according to the log of the *Zuñiga*, she and some of the others, including the *San Martin*, ran 400 miles in three days, and sighted the north of Ireland. Then the wind went to the south, and drove the whole fleet northwards;† but on the 15th the Duke was able to report, when about 70 miles north-west of Rockall, that 95 ships were with him.‡ On August 23 and 24 there was a great storm, which scattered the ships, and on August 26 some found themselves in 63° N. lat. Survivors inform us that at this time frequent inquiries were made from the flag-ship as to the welfare of the *Rata* and of Don Alonso de Leyva.

When the Armada was in lat. 58° N. off Rockall, a momentous conference took place on board the *San Martin* as to whether it would be better, on account of the famishing state of the crews, to make for the Irish coast, or to follow the safer course into the Atlantic. We can quite imagine how difficult it was to reach unanimity on such a terribly pressing question. Calderon reports that, while Diego Flores advocated the former course, the Duke was led to decide to keep to the westward. Recalde, however, with seventeen ships, had already separated from the Duke; in desperate straits for fresh water, and with the crews dying by scores, they arrived at the fateful decision of making for the Irish coast.

Besides those ships that at first accompanied Recalde, others that had suffered special damage in the fighting, and were to leeward, joined him later on, all hoping to reach port, obtain water, and do some repairs. So that the Lord Deputy Fitzwilliam may not have been far wrong in reporting that fifty-nine ships were sighted from the Irish coast.§

The galleass *Zuñiga*, after her rudder was injured in a gale, fell in with the Duke's squadron, but the Duke told her commander that he could render no assistance, and he would have to get on as best he could. Falling away to the south-east, he came up with Recalde, but their appeal for help again met with a similar answer, and as best she could the *Zuñiga* made her way southward.

The ships that had followed Recalde were again scattered in a south-westerly gale on September 2, and, according to their position

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* Laughton, vol. 2, p. 370.

† State papers (Spanish), 1587–1603, p. 461.

‡ One of the prisoners examined at Dingle said he thought this figure was too high, as he only counted 75 ships on that day.

§ State Papers (Ireland), vol. 136, p. 43.

to windward, they all dropped in upon the Irish coast at different points about the same time, between September 1 and 5.

We must imagine this group of vessels approaching the Irish coast from the north-west, and forced inshore. Those most to windward would reach Kerry, others Clare, Galway, or Mayo; while the leeward ships, failing to weather the north-west corner of Mayo, would fall away into Donegal bay. And in this order they arrived.

Some ships that sighted Ireland at this time tacked to north-west and gained an offing before the wind veered, and thus escaped; among these was Calderon's hulk *San Salvador*.

Martinez de Recalde could not personally take much part in the direction of affairs, for he was very ill; according to the evidence of one of the prisoners examined at Dingle, he took to his bed after the battle of Gravelines, and never left it until the day they sighted the coast of Kerry. Experienced old sailor that he was, he no doubt pulled himself together when the landfall had to be made, and thus brought his ship, with two despatch vessels, on September 5, safely to anchor under the lee of the Great Blasket island. Another large ship, which had sighted the Blaskets on September 1, and had been standing off and on, met him at sea and followed him in in safety. This ship was the vice-flagship of the Castillian squadron, and must have been the *San Juan Bautista*.* During the gale of the 10th, the *Nuestra Señora de la Rosa*, in attempting to enter, struck a rock, but ran on, firing guns for help. She anchored near to Recalde, but at two in the afternoon suddenly went down. Her pilot's son, who was washed to the mainland on some planks, was brought a prisoner to Dingle, and was the sole survivor. He gave in his evidence that this ship carried, besides her own guns, twenty-five field pieces of brass, and 50,000 ducats in gold and silver coin. Following the *N.S. de la Rosa* at 4 p.m. came the *San Juan* of Ragusa, her mainmast gone and her sails in tatters. She also anchored near to Recalde and sank, but not before the crew and some pieces of artillery were saved. In this place seventy years ago the Blasket islanders fished up a brass gun, about a three-pounder. Its build is peculiar, in that the chase is heavier than the breech, and from the position of the trunnions it balances with the muzzle down. The coat-of-arms on the gun is an uprooted tree with a band across it. It is still preserved in Clonskea Castle, near Dublin.

Recalde, in the *San Juan*, and the surviving ships with him, remained in the Blasket sound for thirteen days, and then passed on to Spain. Recalde showed consummate skill in selecting his anchorage, for the only wind that could make it unsafe would be a fair wind for Spain. Before he anchored, or soon after, a large Biscayan fell away to leeward, between the Blaskets and Kerry Head, and was lost with all

* 'Duró, La Armada Invencible,' p. 315.

hands, while a zabra, with twenty-four men,* went ashore in Tralee bay, where her crew were all hanged.

On or about the day that Recalde entered the Blasket sound, four large ships and three despatch boats entered the Shannon, and, sailing up, anchored safely in Scattery roads. In the State Papers it is called "Raviskeith," but as Inishcathy, or Inishkeith, was the old name for Scattery island, the best roadstead in the lower Shannon is undoubtedly indicated.

That the ships should have reached Scattery roads and left without mishap is another instance of good pilotage. While there they burnt the *St. Marcos*, a great galleon that had suffered much in the fighting, and was no longer seaworthy. The remaining ships left the Shannon on the 11th, the wind then being north-east, and possibly were among those that got back to Spain.

In Mal bay, on the west coast of Clare, on September 10, at two o'clock in the afternoon,† two large ships were wrecked: one, hailing from San Sebastian, came ashore at Doonbeg; another, a ship of Flanders, after an attempt to get shelter behind Mutton island, was wrecked under Tromra castle.

Numerous local traditions about these wrecks exist, some quite fabulous, but the relics, which were numerous up to the early part of last century, have disappeared, except a richly carved and inlaid oak table with mahogany top preserved in Dromoland castle (see p. 446). The graves of the men washed ashore, or executed by Boetius MacClancy, Sherriff of Clare, are still shown at Spanish Point, near Miltown Mal bay.

The galleass *Zuñiga*, which had nearly succeeded in rounding the Blaskets, was driven by the westerly gale back on to the coast of Clare; but the wind shifting to south, and finding herself hemmed in by land on both hands, she ran up Liscanor bay on September 5, and found safe anchorage off the castle of Liscanor. Juan de Saavedra, who commanded the infantry on board her, in a letter to the king called the place "Tue," which Major Hume, in editing the Spanish State Papers, suggests meant "Tralee." It could not have been Tralee, for the ship was driven by a southerly gale, which would have been right out of Tralee bay. Moreover, when her boat landed, seeking food and provisions, the sheriff reported that the ship that was anchored a mile off the castle of Liscanor was the *Sumiga*.‡

"Tue" would have been the Spanish phonetic spelling of the Irish word *tuath* for "district," Tuath i Conor, or "the district of Conor," being the old name for the region surrounding Liscanor bay.

The *Zuñiga* sailed on the 12th with a fair wind, and got clear of the Irish coast.

A great number, probably twenty ships, of the Armada were

* State Papers (Spanish), 1587–1603, p. 463.
† Ibid., 1588, p. 463. ‡ Carew Papers.

sighted off the Clare coast: four anchored in the open sea off Loop head; two of these were probably those wrecked in Mal bay, while the others, as well as two ships which were seen at anchor for three days outside the Arran islands, may have left the coast in safety.

The *Falco Blanco* (mediano) was lost somewhere in Connemara—that is, in Tige ne Boulie O'Flahertie's country. Tradition points to Davillaun, near Boffin, as a possible site. Unlike Clare, this country was practically outside English control, and the survivors of this wreck, including Don Luis de Cordova, were at first cared for by the O'Flaherties, who, sailors themselves and knowing something of

LISCANOR BAY, SHOWING IN THE DISTANCE THE CASTLE OFF WHICH THE "ZUÑIGA" ANCHORED.

the outside world, were inclined to protect the survivors. Threats, however, induced them to deliver up the prisoners, and, with the exception of Don Luis, a few officers, and two others who were hidden away by the townspeople, they were all beheaded or hanged in Galway.* The guns of the *Falco Blanco* and of two other ships wrecked in Mayo were afterwards used by the O'Flaherties and Burkes to fortify their castles when they went into rebellion against the English. A galleon sailed up to within a mile of Galway seeking relief, seventy of her company, who landed,† were made prisoners, but the ship and over 300 men were lost.‡

* Hardiman, 'History of Galway.'

† Ibid.

‡ Ed. Whyte in State Papers (Ireland). According to local tradition, a large piece of oak embedded in the sand at Barna is a portion of this ship.

Passing north of Galway to Clew bay and Mayo, we meet with definite information of the loss of the great ship *El Gran Grin*, with Don Pedro de Mendoza on board; striking the rocks of Clare island, she went down. For some days those who had escaped safe to land, numbering one hundred, hoping that their lives at least would be spared, and hearing that other Spaniards had landed to the northward, asked that they might be sent in boats to the mainland; but Dowdarra O'Mailie, who was chief of the island, and wished to stand well with the English, put them all, including Don Pedro, to the sword.

Another ship was wrecked in Clew bay, at a place then called Finglass, in the barony of Borrishoole. From this wreck sixteen men landed. Tourglass, on the Currawn peninsula, is evidently the site, for local tradition still points to the ledge on which the Spanish warship struck.

One of the most interesting places in connection with the Armada is Blacksod bay. In the Irish State Papers we find that a great ship came into the bay on September 6 or 7, and anchored in the middle of the bay between Torane and Ballycroy. This ship was no other than *La Rata Encoronada*, with Don Alonso de Leyva and his young nobles on board.

Mr. Froude gives a faithful account of the wreck of this ship, but he gets into confusion as to the subsequent events. Soon after the *Rata* anchored off Ballycroy, which was an exposed anchorage, another great ship, the *Duquesa Santa Ana*, sailed in, and, going up the bay, was reported to be at "Pollilly, off Torane." This is the best anchorage in Blacksod, and would nowadays be described as "Elly bay off Tirawn."

Besides these two ships, another came in and anchored off "Bealingly," which I have reason to believe was the Bull's Mouth at the southern end of the bay. She had no "cock-boat," and failed to communicate with the shore, and went to sea after a week's stay. This vessel was probably *La Nuestra Senora de Begoña*, for when the *Zuñiga* left Liscanor, she fell in with the *Begoña* at sea, and received from her the news of the loss of the *Rata*. The *Rata* dragged her anchor, and was seen stranded on September 11. De Leyva and his company landed and proceeded to fortify themselves in an old castle close by. Landing all the treasures that they could save, and their armour, they burnt the wreck. The old ruined castle of Doona marks the site with accuracy.

I visited this place some years since, and found tradition existing of "the great ship that came there, hundreds of years ago." The people had on various occasions, "when the strand was low," lifted some of the timbers. On a subsequent visit, I secured one of her frame timbers of Italian oak, burnt off at one end.

De Leyva did not stop at Doona, but crossed the bay with his company, and, joining the people of the *Santa Ana*, they proceeded to

fortify themselves at the ruined castle of Tirawn, but subsequently went on board again and put to sea.

These events being more connected with history than geography, I must thus dismiss them and follow the fortunes of the *Santa Ana*, as I think I have found the exact site of her destruction. Failing to get towards Spain, owing to the wind on the 15th having backed to the southward for another cyclone, she kept away northward for Scotland, but is reported to have been wrecked in Loughros More bay, in Donegal. De Leyva and the two ships' companies, making about 800 all told, entrenched themselves on shore close to the wreck for nine days, and then made their way overland to Killybegs. Finding there the galleass *Gerona* in a very battered state, they repaired her, mending her rudder that was broken; and on October 16 put to sea for Scotland with 1300 men on board. She rounded Ireland's north point in safety, but, her rudder giving way, she was driven at midnight on to the "Rock of Bunbois," near the Giant's Causeway, and all perished except nine sailors and soldiers, who managed to reach the shore, and were kindly treated by the MacDonnels in Dunluce castle. These men told the story of the wrecks of the *Rata*, the *Santa Ana*, and the *Gerona* to survivors of another wreck, the *Valencera*, and these men, in repeating the story, mixed up the events regarding each of these ships, so that an examination of the geographical conditions can alone unravel the tangle.

Major Hume's criticism * of Prof. Laughton's attempt to clear the question is sound, though he goes astray about the place where the *Rata* sought shelter and was wrecked. One event, however, impressed itself on me as giving a most reliable clue. As the story comes to us, the *Rata*, finding herself drifting, and having only one anchor, passed a cable to a rock, and so tried to save herself from being stranded. Now, there is no rock off Ballycroy where such a thing would be possible; the only rocks where such a manœuvre would be possible, at any of the places where these wrecks occurred, are in Loughros bay. It was, therefore, I feel sure, the *Santa Ana* that tried this plan of saving herself. What appear to be her remains may still be seen when tides are low, and one of her large guns lies on an island in Kiltooris lake, close to the scene of the wreck.

Before returning to the order I have followed of taking the ships from windward to leeward, it may be well to deal with the site of the last great catastrophe that closed the careers of Don Alonso de Leyva and his gallant company. Tradition connects the wreck of the *Gerona* with the little bay called Port na Spagna to the eastward of the Giant's Causeway, but those who reported from personal knowledge said she was wrecked on the "Rock of Bunbois," that is, in English, the

* Hume, *Transactions of the R. Hist. Society*, vol. 11.

rock of *Bush Foot*, which is a little to the westward of the Causeway; and the Lord Deputy reported December 31, "that three fair pieces of brass lie among the rocks of Bunboyes, where Don Alonso was drowned, and can be recovered."

It is hard to doubt tradition that has fixed a name to a place. It is also hard to believe that a second wreck occurred in the vicinity of the Causeway, because the reports of events about Dunluce were very full and complete. Taking all things into account, I incline to the conclusion that the remains of the *Gerona* lie off the Bush river near Port Ballintrae.

REEFS OF BUSH FOOT, WHERE DON ALONZO DE LEYVA AND 1300 MEN WERE DROWNED.

The Lord Deputy did not get the guns. When H.M.S. *Popinjay* came to raise them, they found that the MacDonnels, aided by two Spaniards, had raised the guns and also two chests of treasure. The guns were used to defend Dunluce castle against the English,* and one of the chests is still in Glenarm castle.

But to return. At Inver, in Broadhaven, one large ship was wrecked about the time that the *Rata* entered Blacksod bay, but beyond the report that all the treasure in her was saved by the Government officer, I can find no details. She was the first of those trapped by the north coast of Mayo, which, as I have said, projects far beyond the points shown in the maps of the west of Ireland then existing, and that have come down to us.

* Hill, 'The MacDonnels of Antrim,' p. 189.

Failure to weather Eagle island threw no less than nine ships, including the ship lost in Broadhaven, in the direction of Donegal bay, and they were hopelessly embayed. Passing the ship wrecked at Inver, one was lost on the coast of Tirawley, possibly in Ballycastle or Lackan bay; and the survivors from this wreck, including some ecclesiastics and other persons of note, were captured by William Bourke, of Ardnaree, near Ballina, and by him were handed over to George Bingham, brother of the Governor of Connaught, who executed them.

Farther east three great ships, including the *San Juan* of the squadron of Castille, driven further to leeward, and, as they said, "failing to weather Cape Clear" (in this case it was Eagle island), anchored off Streedagh strand, between Sligo and Ballyshannon.

History in this case, as contained in Captain Cueller's letter, first published by Captain Duro, and of which several translations have been made, furnishes ample material for discussing questions of topography. The ship of the Levant squadron, probably the *Labia*, in which Captain Cueller then was, and her two companions were driven

MOYASTA SOUND, IN THE CLIFFS OF NORTH MAYO.

STREEDAGH STRAND, WHERE FENTON SAW PILES OF WRECKAGE AND MANY HUNDREDS OF DEAD.

ashore and wrecked in the north-westerly gale of September 10, with the loss by drowning, or massacre when they reached the shore, of over 1200 men. Rocks off the eastern end of Streedagh strand, in memory of the event, still bear the name of Carrig na Spagna, and Cueller says the shore he landed on was "a beach covered with very fine sand, shut in on one side and the other by great rocks," and considering the direction of the wind and other circumstances, the smooth strand to the eastward of Milkhaven was, I believe, the exact spot where Cueller was washed ashore.

The Lord-Deputy Fitzwilliam visited these strands after the wrecks. Fenton had previously reported 1200 dead, and great masses of wreckage. The bodies were, no doubt, by nature or by human agency, buried in the sandhills, and nowadays, when storms shift the dunes, quantities of human bones are brought to light. This is well known to the local inhabitants. I have found some of them myself, inshore from where Cueller's ship came, and being told that they were of more frequent occurrence along the Streedagh shore, I searched the dunes there, but at that time failed to find any. The occurrence is, no doubt, only occasional. A gentleman in Sligo possesses the figure-head of one of these vessels, but I know of no other relics.

Mr. Allingham, of Ballyshannon, has done much to elucidate Captain Cueller's wanderings around the mountains, and to McClancey's castle on Lough Melvin, and I am satisfied that, with his aid, I have followed

Cueller's track till, nine months after the wreck, he was ferried probably from Dunseverick, in Antrim, to Scotland.*

One of the Armada transports, that had "cast out 120 great horses and 60 mules" and had lost her mainmast, was assisted into Donegal harbour by a turf boat. Whether she was subsequently lost or not is uncertain, but as a large ship was reported lost in O'Boyle's country,† I think she may have been the one referred to.

On September 5, three ships were seen from the Sligo coast making for Killybegs. One of these, the galleass *Gerona* referred to above, got safely in, one was lost a little outside the entrance, the third appears to have run ashore in the harbour, and, breaking up, the wreckage was used by De Leyva and his people in repairing the *Gerona*. When De Leyva therefore reached Killybegs, he found over 1500 Spaniards in McSweeny ne Bannagh's country before him, but when pressed to assist the chieftains of these parts in making war on the English, he replied that the levying of war in Ireland was not included in the instructions he had received from King Philip.‡

At the entrance of the United Service Institution in Whitehall may be seen an anchor said to have been raised from an Armada wreck in

McCLANCY'S CASTLE ON LOUGH MELVIN, WHICH CAPTAIN CUELLAR HELD AGAINST THE LORD DEPUTY.

* Allingham, 'Captain Cuellar's Adventures in Connacht and Ulster.'

† Carew Papers, 1588, p. 472.

‡ 'Don Philip O'Sullivan Beare.' Translation by M. J. Byrne in 'Ireland under Elizabeth,' p 61.

Arranmore roads.* In a bay just north of Arranmore, and within the shelter of the Gola islands, is another Carrig na Spagna, marking undoubtedly the site of a wreck concerning which tradition is very clear. Living men remember guns having been raised, and one family is said to have made quite a fortune out of the brass guns, and, no doubt, more valuable articles that they recovered. A few years since a salvage steamer tried to work there, but without much success.

At the time of the Armada this part of Donegal was outside all control of the English Government, and the accounts received were consequently unreliable; the State Papers contain no definite information beyond the fact that large numbers of Spaniards who landed there

RICHLY CARVED AND INLAID OAK TABLE WITH MAHOGANY TOP, PRESERVED AT DROMOLAND CASTLE.

were befriended by the O'Donnells and McSweenys. I think that the name of one of these Donegal wrecks was the *Juliana;* for in spite of an explicit statement by the survivors of the *Valencera* that the *Labia* and the *Juliana* went down with all hands at sea, we find many years afterwards (1596), when envoys came to the Earl of Tyrone from King Philip, they found with him some of the survivors from these ships.

We now come to the last ship that was certainly lost in Ireland, *La Trinidad Valencera*, a great Venetian ship of 1100 tons, with Don

* Local tradition has it that this anchor was lost by an Armada ship that got safely away.

Alonso de Luzon, Ponce de Leon, and other renowned officers on board. In the gale of the 2nd she had sprung a leak that could not be kept under, and, sailing in through Inishtrahull sound, she ran up along the coast of Inishowen, and anchored in Glenagivney bay (called Kinegoe bay on the charts). It took two days to land her crew and some men from the *Bark of Hamburg* that were on board, numbering in all 600 men.

When the *Valencera* sank and became a wreck, Don Alonso and his company marched 18 miles inland to Illagh (or Aillagh), O'Dohertie's town, where they surrendered to the English, after many had been shot down.* The ruined castle of Ellagh close by, on the north side of the railway between Derry and Buncrana, still marks the site of this surrender. The survivors who escaped capture, in reporting the wreck to the pilot-general of the Armada, stated that they were wrecked in O'Dohertie's country, close *to the Blaskets*. There were evidently men on board who had been on the Kerry coast, and, mistaking their land-fall, and assuming that the Garvan islands and Inishtrahull were the Blaskets, they may have run along the coast looking for Smerwick harbour.

Just before last Christmas I ran in through Inishtrahull sound, in a westerly gale, and up along Inishowen to Lough Foyle, passing Glenagivney bay on the way, which offered no shelter for a ship to anchor in, and the idea of mistaking the whole place for the Kerry coast, as they appear to have done, did not seem very extravagant.

The old bell in the church of Carndonagh in Inishowen is supposed to have belonged to the *Valencera*. The *Valencera* belonged to the Levantine squadron, as did also the *Rata*, the *San Juan de Sicilia*, the *Labia*, the *Juliana*, to which I have referred, and five other ships. The men they carried numbered 3527, out of which only one vessel, the *Regazzona*, and about 400 men, returned to Spain.

In enumerating the ships wrecked on the coast of Donegal, I feel sure that some are omitted.† Tradition exists of some men washed ashore in Ballyness bay, and the gold rings off their fingers are still preserved at Horn head. There are accounts in the State Papers which would seem to imply that other ships were wrecked in McSweeny ne Doe's country, and that one ship was burned by the Spaniards in Lough Swilly. If I am correct, it would reduce the number of ships unaccounted for, but the ground is too uncertain to build any definite conclusions upon.

During the whole time that the Armada was beating this terrible retreat, the wind was oftener southerly than in any other point. It varied chiefly from south to south-west, and in spite of this some of the ships made their way to windward, or at least were able to

* Barrow, 'Life of Drake,' p. 333; and Hume, *Trans. of R. Hist. Soc.*, vol. 11, "Some Survivors of the Armada."

† State Papers (Ireland), vol. 137, 39, II.

maintain a southerly course, which proves, I think, that they were able to sail successfully within about six points of the wind. Others probably had no weatherly qualities at all, only made way when they got the wind abaft the beam, and had to run before every gale.

The weather all over the British area was exceptionally stormy: cyclone followed cyclone, those of August 23–24, September 2 and 10 being the heaviest. It was in this last north-westerly gale of September 10 that most of the wrecks occurred. Ed. Whyte, who was clerk of the council of Connaught, writing of it, states, "There blew a most extreme wind and cruel storm the like whereof hath not been seen or heard a long time." *

Cyclonic conditions prevailed until after October, when our interest in the weather, so far as this paper is concerned, comes to an end.

Before the paper, the PRESIDENT said: Mr. Spotswood Green is not unknown to the Royal Geographical Society. It is quite true that it is many years now since he read us a paper here, but there are some present who remember his reading a paper on his ascent of Mount Cook in New Zealand, and, at a later period, another paper upon his ascents of the Rocky mountains.

After the paper, the PRESIDENT: I will ask Major Martin Hume to address us. He is, as you know, one of the highest living authorities, being the editor of the Spanish State Papers. He has just arrived from Madrid.

Major MARTIN HUME: I personally am very deeply indebted to Mr. Spotswood Green, both for his extremely interesting and learned paper, and also for the article which treated of the same subject, which he published in *Macmillan's Magazine* some years ago. It was necessary, indeed, for some gentleman of geographical taste and knowledge and with full local information to supplement the conclusions that we, gathering our facts from entirely different sources, had arrived at. It will occur to any one, after having seen the inhospitable coast upon which these unfortunate ships were lost, how difficult it was for the men struggling on shore, half starved, despairing, drowning, to recollect, even if they heard or understood, in a foreign language the names, outlandish to them, of the cruel rocks upon which they were lost. So the Spanish Records have contained, only in a few cases, distorted phonetic representations of the names of the localities in which the wrecks took place. We, it is true, have arrived by a process of guesswork at conclusions, in most cases not very widely different from those arrived at by Mr. Spotswood Green, with regard to the position of the various wrecks. But, after all, it was guesswork at best. And, as I say, geography has come to the aid of history in this matter, and has enabled us to fix the exact positions where these tragedies took place. There is another science which has to thank Mr. Spotswood Green for the information he has conveyed to us to-night—that is, the science of ethnology. Any one who goes along the coast of Ireland and along the Devonshire coast will in one locality after another find that the inhabitants of this or that village are asserted to be descendants of the men from the Armada wrecked upon their coast; that the dark complexion of the population is owing to the fact that a number of men of the Armada settled and married in that part of the district. Hardly a Cornish manor-house exists without the so-called Armada

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* State Papers (Ireland), vol. 136, p. 57.

cheats. There is very small foundation for this, either with regard to Ireland or the West of England. In the end of the year 1588, FitzWilliam reported that, with the exception of a few score wandering Spaniards, the whole of the rest had been either killed or had escaped to Scotland. In 1596 there was a letter written, which I have had the privilege of copying—written by six men who had escaped and remained in O'Donnell's country, appealing to the king to let them come back to Spain. They said they alone remained of all who landed. These were six men, and this was only eight years after the Armada was defeated. Even supposing these men were wrong and there were a dozen or two more in various parts, there never were enough men to influence in the slightest degree the complexion or the ethnological peculiarities of the inhabitants of the Irish coast. The connection between Ireland and Spain was intimate before the visit of the Spanish Armada; Spanish bishops were appointed to Irish sees, Spanish wine was brought in plenty to Galway long before the time of the Armada, and some infusion of Spanish blood may have been introduced. But it is certain that the English at the time of the Armada prevented anything like a settlement of Spaniards there. The story which Mr. Spotswood Green has sketched of the *Rata Coronada* and the *St. Ana*, with the king's favourite and second in command of the Armada on board, Don Alonso de Leyva, will show you how necessary it was, cruel as it seems to us now, that the Spanish should be exterminated almost to a man. If you look at the map in your hands, you will find that the head of Sligo bay and Donegal bay were practically the key of Ireland. Don Alonso de Leyva, after the wreck of the *Rata* and *St. Ana*, found, when he had eventually got up to the McSweeny country at Lochros bay, that there was a large ship and company in McSweeny ne Doe's country near. He went south, marching over the mountains for 15 miles to Killybegs harbour, one of the finest harbours in Ireland, and a point of special danger for the English. When he arrived there he had altogether two thousand men, what with his own men and the men from the great galleass *Girona* in Killybegs harbour. Here, then, was the crucial point. A swift despatch boat was sent to Spain, begging and praying to Philip to send aid at once. News went through France to Spain that at last the Spaniards had conquered Ireland, and if de Leyva had been able to stay in force at Killybegs, England might have lost Ireland, and perhaps have been conquered too. So you see it was not without reason that the word went forth to slay and spare not. I myself have been told more than once how one crew after another was massacred without mercy. I have pointed out how necessary it was, because if de Leyva had been more determined, Philip more prompt, and McSweeny ne Doe had been more confident, then certainly the O'Donnells would have joined the O'Rourkes, Sligo and Donegal made common cause, and all the west of Ireland would have been up, and Ireland would probably have been lost to England. It is these facts of geography that show how important it was that this part of the country, Sligo and Donegal, should be held firmly to England, for Munster was crushed and Ulster was unready, but the west was ripe for revolt. Geography has helped us to understand the historical position of these men who landed from the various ships. I am sure we all thank Mr. Spotswood Green for the very interesting paper he has given us, showing us not only the inhospitable and terrible rocks upon which these ships were cast, but also showing how important it was at the time that the Spaniards should be held in check if the English were to remain masters of Ireland and subsequently masters of England. I for one thank Mr. Spotswood Green most heartily, and I think every one else will do the same.

Prof. LAUGHTON: I am afraid there is very little I can say, for in most of what I had been thinking of, Major Hume has anticipated me; so that, beyond

expressing the very great satisfaction I have felt in finding that a gentleman with Mr. Spotswood Green's professional advantages has taken the subject up in the spirit he has, any further comment on the paper is almost unnecessary. I have been especially glad to find that he emphasized, as he has done, the continual intercourse between the west of Ireland and Spain. As Major Hume has pointed out, there was similar intercourse between the west of England and Spain, of which, also, there are abundant ethnological traces remaining. As a further evidence of this, I may call attention to the great number of Spanish chests that are found in the different parts of the country. During the past few years I myself have had perhaps a hundred letters asking about these chests. They all, according to tradition, belonged to ships of the Armada, of which something like five hundred must have been lost on our coasts. But, in fact, these Spanish chests are handsome pieces of furniture, and were brought to this country in considerable numbers. They were not necessarily connected with the Armada, though no doubt some few of them were in the Armada ships. Mr. Spotswood Green has called attention to one very interesting point—the knowledge of the navigation of the west of Ireland which the Spaniards must have had. In many cases, no doubt, they were quite ignorant. For instance, the Spanish seamen who brought the *San Pedro* into the Channel and wrecked her close by Salcombe under the impression that they were in the fair way to Spain, cannot have known much about the navigation of our seas. If it is true—which I doubt very much—that a Spanish vessel was lost on the coast of Normandy and gave to it the name of Calvados, these pilots, again, could not have known much about it. But, on the other hand, many of the Spaniards were well acquainted with the navigation of the west coast, a fact which Mr. Spotswood Green has illustrated by the way in which Recalde brought his ship to anchor at the Great Blasket. He was the commander who brought over the poor wretches of Italians who were put to death at Smerwick in 1580. Recalde was probably chosen for that expedition as having some knowledge of the coast already, and the men that were with him then had necessarily some experience of the coast. That was only one instance, but it corroborates what Mr. Spotswood Green has pointed out as to Recalde's knowledge of our coasts. He has shown, also, that there were others who knew the Shannon, and found safety there, while others were lost wholesale further north. I can only repeat my thanks to Mr. Spotswood Green for the admirable way in which he has elucidated this very tangled subject.

The PRESIDENT: I am sure you will be glad to hear a few words from Mr. Julian Corbett, who is not only known by his writings on Drake and others, but is also the War Course lecturer on naval history.

Mr. JULIAN CORBETT: I feel, with Prof. Laughton, that after the admirably exhaustive paper we have heard, there is really very little left to say, except to congratulate the Society on having had the good fortune to get a paper from Mr. Spotswood Green. There is, however, one point which perhaps it might be well to clear up. It does not refer to a wreck on the coast of Ireland, but to one on the coast of Scotland; that is the one that took place in Tobermory bay. We have heard a good deal about it lately within the past year. Some enthusiastic persons, under the impression that it was the treasure-ship of the Armada, have been spending a lot of time and money in trying to find this very mythical treasure. The old tradition in Scotland was that this ship was called the *Florida*. But as no such name occurs in the list of the Armada vessels, some ingenious scholars thought well to amend the tradition to make it agree with the lists. In these lists they found a ship which is sometimes spoken of as the *Florencia*. So the wreck was re-christened *Florencia*, and, to give interest to the new discovery, it was

alleged that the *Florencia* was the treasure-ship of the Armada. Of this there is no evidence whatever. All we know of the treasure of the Armada is that it was distributed amongst a number of ships. The great difficulty, however, which the treasure-seekers have to meet is not as to whether the *Florencia* was one of the treasure-ships or not. There is another much greater. This so-called *Florencia* came back safe. We know all about her. Her real name was not the *Florencia*. The mistake arose from her having been usually described in the lists as the "Galleon or Admiral of Florence," which means she was the vice-flagship of the Tuscan navy, which was lent or chartered for the Armada. Her real name was the *San Francisco*. She was generally spoken of as the "galleon of Florence," so as to distinguish her from another *San Francisco*.

Now as to what this Tobermory wreck really was. From the correspondence of the Spanish ambassador in Paris, we are able to identify her exactly. He tells us that she was the *San Juan Bautista*. This ship was not a galleon; she was a *nao*, or merchantman, of about 600 tons. She had nearly 200 troops on board; she carried 24 guns and about 60 seamen; and we also know she belonged to a man called Fernando Ome. In short, so far from being either a galleon or a treasure-ship, she was merely a hired transport. The authority for all this may be found by any one who cares to consult Captain Fernandez Duro's 'Armada Española.'

The PRESIDENT: It is with unusual confidence I ask you to join in a hearty vote of thanks to the lecturer to-night, for this has been one of the most interesting addresses I have ever heard here.

THE GEOGRAPHICAL FUNCTIONS OF CERTAIN WATER-PLANTS IN CHILE.*

By G. F. SCOTT ELLIOT.

EVERY one who has read Darwin's 'Geological Researches' must be generally familiar with the aspect of such a Chilian river as the Rio Aconcagua. It is a strong brown or coffee-coloured torrent, churned into white foam and whirling eddies, as it hurries down its broken and precipitous course over boulders, stones, and rocks.

There are plenty of green shrubs and trees, which are collected for the most part towards the bottom of the valley, though a few pioneer bushes, rooted in screes of rolling stones, may be noticed for some little distance up its sides. These valley-sides are exceedingly steep; bold precipitous cliffs occur here and there; below such cliffs there are usually steep earth-slopes or conical screes of rolling stones. Vegetation is practically non-existent on the upper valley-sides, or what little does exist is scattered, and does not form a close sward. A shower of rain will, in consequence, exert an extraordinary amount both of denudation and corrosion: every drop of water on these steep, bare earth-slopes might carry away or start the motion of many earth-particles. One marked peculiarity is the presence of large irregular blocks of stone which have tumbled down from the upper cliffs.

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* Read at the Royal Geographical Society, January 29, 1906. Map, p. 528.

Such blocks are more easily traced on the other side of the Andes, in the valley between Las Cuevas and Puente del Inca. This valley is broad and arid and desolate. It is occupied by an old valley floor of horizontally stratified shingles and sand. Upon its level surface there are scattered irregular blocks of all shapes and sizes, for the most part angular and scarcely at all rounded by water-action. The present river has cut a little channel for itself, and is forming a new valley-floor considerably below the level of the old one. It is so small as compared with the valley, that one cannot help the conclusion that it has been robbed of most of its tributaries by the Pacific rivers, such as the Aconcagua.

Now, in the Aconcagua valley such fallen blocks would reach the torrential bed of the river in company with quantities of sand and fine

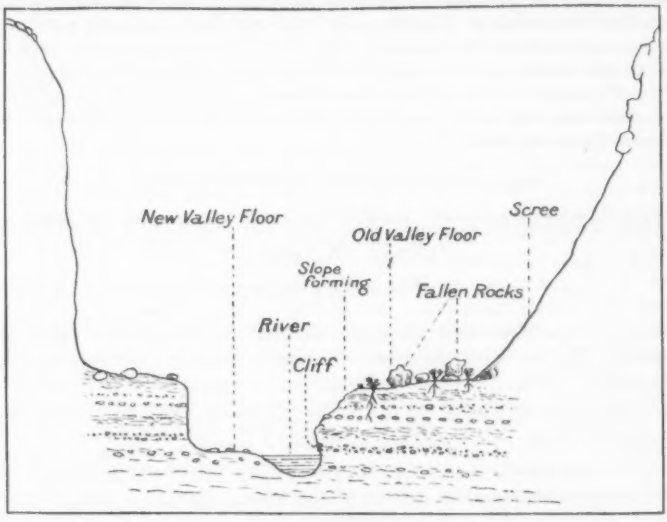

FIG. 1.—VALLEY BETWEEN LAS CUEVAS AND MENDOZA. STRATIFICATION OF ALLUVIUM (DIAGRAMMATIC).

particles. There, they would be gradually ground and polished into rounded stones, such as form the shingle, and which vary in size from that of a man's head to a pigeon's egg.

The torrential Aconcagua, like most Chilian rivers, so soon as it emerges from its narrow steep-sided valleys, at once deploys its waters into a magnificent and stately stream, winding through wide-stretched glaring-white beds of shingle and of sand. The actual bed of the river seems to be always changing, winding or straightening itself, or sometimes cutting through an old deposit and abandoning the old channel. In floods especially, extraordinary changes are brought about, especially

in the Mapocho river, whose floods have been famous in history since the early days of Pedro Valdivia.

The shingle brought down is perpetually being shifted and disturbed. Charles Darwin, in an eloquent passage, alludes to this.*

Such a valley would probably never form the beautiful valley-floor or alluvium so common in Chile, were it not for the action of certain plants.† These plants may be arranged in the following distinct groups, all of which have their own special duty to perform: (1) Settlers on the upper bank; (2) bankfoot colonizers (such as Phalaris in Britain); (3) colonists in shallow water (Litorella, Scirpus, spp. in Britain); (4) reeds or colonists in deep water (Equisetum, Scirpus spp. in Britain); (5) the marsh-filling series, which gradually change marshy to firm ground; (6) small prostrate mud plants (Elatine); (7) submerged, swimming, or floating plants (Potamogetons, Nuphar, Lemna).

On the Rio Aconcagua, a composite shrub, 3 to 4 feet high (*Baccharis marginalis*), is usually one of the first to settle the banks. Its leaves show distinct protection against drought, for they have a very well-marked gummy secretion. These glaring white shingles are extremely arid and hot on the surface.‡ Two other composites are also common, *Tessaria absinthoides* and *Proustia*, sp. *Prosopis fruticosa* (Leguminosæ) may also be found. It is sometimes 10 feet in height, and has strong stipule spines 4 cms. long. Willows and poplars are exceedingly common also, but a very large proportion of them have been introduced. Nevertheless, *Salix Humboldtiana* is a native plant, and, although aliens, these willows are extremely important as bank settlers. So also is the alien bramble, which often occurs in dense thickets along with the Baccharis.

These plants will establish themselves on an island or on the bank summit above the ordinary level of the water. They will settle the shingle, preventing it from movement in the next flood, and they will also cover it with an entanglement of stems and branches. Sand and floating material must be intercepted by such a thicket, and gradually the deposit of sand and mud will raise this island above the flood-level. Thus a river-side wood is built up which resists encroachment by the stream, and represents so much new land.

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* "Amidst the din of rushing water, the noise from the stones as they rattled one over another was most distinctly audible even at a distance" ('Voyage of H.M.S. *Beagle*').

† I must express my deep gratitude to the authorities of the British Museum for kind help in naming many of the plants, and also to the following, who have very kindly named for me the respective orders mentioned: Dr. Buchenau (Rushes), Mr. C. B. Clarke (Cyperaceæ), Dr. Hackel (Gramineæ), Mr. Bennett (Naiads, etc.), Messrs. Groves (Nitella), Dr. Brotherus (Mosses), Dr. Christ (Equisetum), and Dr. Stephani (Liverworts).

‡ Even at Salzburg, in Austria, where Vital P. Jäeger has examined the colonization of similar river-shingles, the sandy soil may be heated to 40° to 42° C. and reflects the heat strongly (*Botan. Centralblatt*, Band **90**, No. 31 (1902)).

Usually this settling of the shingle extends towards the river from a river-side wood already formed; in this way, land above flood-level might be gradually produced across the whole valley floor from one side to the other. It is a little difficult to trace what happens—or, rather, used to happen—to the edge of the river-side wood farthest from the river. In this part of Chile the natural vegetation is a sort of scrub composed of shrubby plants scattered like the trees in an orchard. These are chiefly thorny Leguminous shrubs such as *Acacia cavenia* and *Prosopis spp.* They would invade the river-side wood and replace it as soon as the soil, in consequence of the river shifting sideways, became too dry to support a dense river-side wood. But I think it

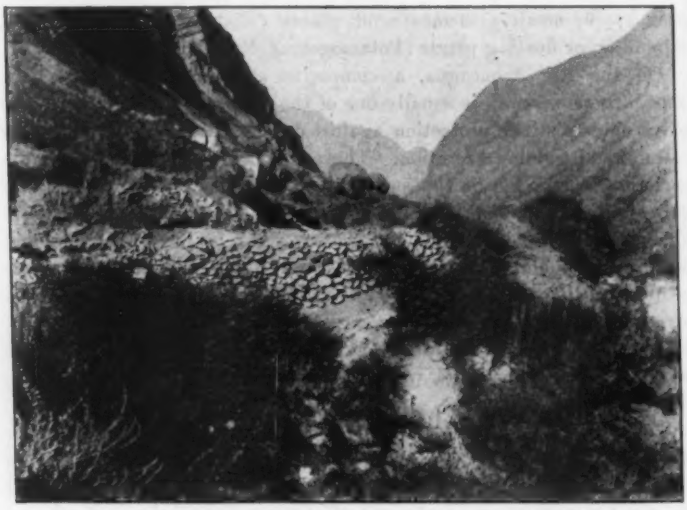

FIG. 2.—RIO ACONCAGUA VALLEY, NEAR RIO BLANCA.

is necessary to take into account the fact that such changes are directly brought about by the action of grazing animals. The guanaco, for instance, would probably not frequent thick jungle next the river, but it would very soon destroy all unprotected vegetation in the less vigorous part of the wood on the outer side.*

One finds, also, in Chile the same serious difficulty which meets one at every turn in Europe. How far has fire, man, or his domestic animals interfered with the normal sequence of events? Many of these rich alluvial valleys have been irrigated since the days of the

* Cf. Schimper, 'Pflanzengeographie,' where climate alone is taken to determine the vegetation of a country.

Incas. Even in the time of Ovalle, "a man who had about 40,000 crowns to employ in lands, flocks, and slaves may every year have a revenue of 10,000 to 12,000 crowns, very lawful and without any trouble to one's conscience." * Every one of the last 400 or 500 years has seen an abundance of water full of rich mud derived from the many varied rocks of the Andes, distributed over those rich meadows: where five crops of alfalfa can be mown in one year, and where three cows can be profitably kept on a single acre. In Britain three acres are allotted to one cow.

On such rivers there are disused river-courses, old abandoned back-waters, and bays where silt and mud accumulates. In such places on the Rio Aconcagua *Scirpus Americanus*, Poir, was of great importance. This plant acts as a reed or as a deep-water colonist in places where there is but little current. Its system of creeping horizontal stems and upright stalks is an excellent one for fixing the bottom and sifting out of floods both sand and mud, and also any "flotsam" of leaves or branches. I also found the same plant on the Rio Bio-Bio acting in a similar manner.

The shallow-water colonists by the Aconcagua were, first, *Eleocharis bonariensis*, Nees. It grows especially along the margins of small streams, and extends a few inches below the water. The rhizomes fix the sand and mud, whilst the vertical stems gather sand and floating refuse. Thus the level of soil gradually rises and the stream is pushed farther off, or, as sometimes happens, the outlet is choked or confused. Round the border of the *Eleocharis* I found a rich development of clover and other plants, but these were only near the water; farther back, most of these plants (usually aliens) were withered by the heat of the superficial layers of sand and gravel. A second shallow-water colonist, *Eleocharis palustris*, R. Br., is found in rather deeper water, some 6 inches in depth. I think this is chiefly important because it fixes the floating material, and thus affords the chance of farther development, but it also acts in a similar way to the preceding.

Where either of these has been at work and formed a shallow marshy hollow near the bank, there I found this attacked by certain grasses—*Eragrostis pilosa*, Beauv., *Paspalum dilatatum*, Poir, and *Bromus unioloides*, H. B. K. These are partly "bank-foot colonizers"—that is, rooted at the foot of the river-bank and growing out over the marsh, and partly belong to the marsh-filling series. Upon them will eventually develop the ordinary vegetation of the neighbourhood.

Near the Bio-Bio river at Concepcion the only shallow-water colonist noticed was *Juncus imbricatus*, Lab. It grows rapidly over wet mud which is occasionally covered by the tide. Two varieties of this plant were found, one of them (var. *Lechleri*, Buchenau) being on

* Ovalle, 'Pinkerton Voyages and Travels' vol. 14.

wet mud, whilst the other (var. *Chamissonis*, Buchenau) was on dry ground above the water-level. (This resembles the two forms of *Polygonum amphibium*.) At this place I also found a very tall grass, *Hierochloe utriculata*, which was a "bank-foot colonizer" growing attached to the very foot of the bank, but extending its branches towards the water like *Phalaris arundinacea*.

Near a river at Chillan, in Central Chile, I found another deep-water colonist, *Scirpus riparius*, Presl. There was also a different marsh-filling series, of which the most conspicuous plants were *Jussieua repens* growing in the Scirpeta, and, near the bank, *Cyperus vegetus*, Willd.

FIG. 3.—ISLAND IN RIO ACONCAGUA, NEAR LOS ANDES.

An important part is always played, both in such lagoons and rivers, by plants which are submerged or float freely in the water. They are chiefly useful as their remains (broken-off pieces and dead leaves) are carried down-stream or accumulate among the reeds.

Very few of these were seen by myself, and they do not seem to be particularly abundant in the rivers; not more common than they would be in Britain. The following were, however, observed: *Nitella clavata*, Kuntze, in water about 1 foot deep, and in a strong current (Bio-Bio) near Concepcion, where I also found a moss submerged in the water—*Sciaromium pachyloma*, Mont., var. *gracilis*, nov. var. *Brotherus*. This moss was in a place where one would expect in this country *Fontinalis antipyretica*, and had a close general resemblance to *Hypnum rivale*.

Near Chillan, *Potamogeton Berteroanum*, R. A. Philippi (*Linnea*, vol. 30, p. 200, 1859–60), *P. striatus*, Bertero (non Ruiz. et Paz.), were found in mud in a rather rapid current. (*P. natans*, *P. pusillus*, and *Zannichellia palustris* occur in Chile: see Gaye.) *Elodea guyanensis*, Michaud, was also found at Chillan. The only Equisetum which I met with was apparently a European species, *E. ramosissimum*, Desf., var. *altissimum*, R. Br. It was abundant in some of the irrigation ditches near Los Andes. (*E. bogotense* is fairly common according to Gaye.)

Wherever bare mud is exposed it is often covered with quick-growing delicate plants, which prevent rain or the current from at once washing it away. Of these, *Nertera depressa* was common; *Callitriche*

FIG. 4.—VEGETATION BY BANK OF RIVER AT TIGRÉ, BUENOS AIRES.

turfosa, Bth., *Hydrocotyle modesta* and *Juncus bufonius*, Linn., var. *genuinus Coutillho* were found. But these are only a few of a numerous group.

Farther south at Temuco, where the climate is essentially similar to that of Great Britain, the Antarctic beechwood is the natural vegetation of the district. I was able in one place to trace a nearly complete series of marsh-filling plants, from the reeds or deep-water colonists to the forest. The most important reeds were *Juncus Dombeyanus*, var. *elatus*, Buchenau, which was 4 feet or more in height, and *Alopecurus antarcticus*,* var. *alpinus*, Hack. Next these came a fringe of

* Dusen speaks of the vigorous growth of this plant in freshwater lakes of Tierra del Fuego, where he only observed here and there *Myriophyllum elatinoides* and *Hippuris vulgaris*. Engler's *Botan Jahrbuch*, Band 24, Heft. 2, p. 179.

sedges, especially *Carex pseudocyperus*, Linn., var. *platygluma*, C. B. Clarke. This grew almost by itself. Pressing upon the sedges, and trying to colonize between them, was a marsh-meadow vegetation about 18 inches high, consisting of grasses not in flower, with the upright stems of *Scutellaria rumicifolia*, *Carex canescens*, *Cyperus reflexus*, a species of Aster, *Polygonum minus*, *Galium eriocarpum*, the long fine glabrous leaves of *Eryngium aquaticum*, *Geranium patagonicum*, and *Apium leptophyllum*.

In drier ground next the wood I found *Valeriana glauca* and a handsome species of *Senecio*. (The species resembled *Senecio otites*, *S. hualtata*, and *S. fistulosus*. It is probably a new species, if these are to be upheld

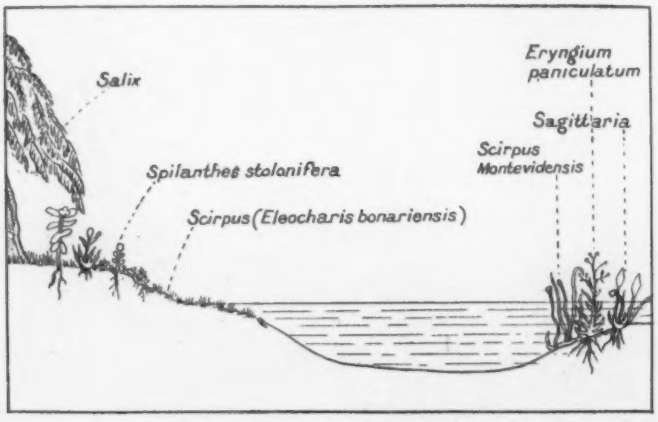

FIG. 5.—IMPORTANT LAND-FORMERS AT TIGRÉ.

as distinct, but very likely both this form and the above three species are forms of one species.)

The most interesting point about this marsh-meadow was the close resemblance to similar associations in Britain. In Great Britain one would find in such places, as the reeds, Scirpus, Equisetum, and Phragmites, *Carex pseudocyperus* would be expected; as the marsh series, such plants as *Polygonum minus*, *Stachys palustris*, *Galium palustre*, *Carum verticillatum*, *Œnanthe*, sp., Ragged robin, *Stellaria glauca*, and *Ranunculus flammula*; whilst near the wood *Senecio aquaticus* and *Valeriana dioica* would be naturally expected. So that in the one case the same species, in other cases different species of the same genus, and again in others different genera (though also British genera) combined in a similar climate to make an exceedingly similar association!

At Tigré, near Buenos Aires, on the bank of the La Plata estuary, I was able to notice the formation of new land by at least a few plants. The banks are almost always covered with plantations of willows,

poplars, and other trees. Indeed, willows are so easily planted that they are often grown for firewood, which is said to be a paying industry. There is rather a confusing series of eucalyptus, acacia, and both naturalized and aboriginal trees near the willow plantations, and one can scarcely resist the impression that in their original condition thick bank woods * covered the shores of all the islands and river branches near Tigré.

The water of the La Plata is full of sediment. The enormous amount carried down to the sea can only be realized by crossing from Buenos Aires to Montevideo, and observing the yellowish-brown of the water throughout the twelve hours' voyage. I have not found any observations of the silt deposited per annum, but the matter in solution has been estimated as 237 grammes per cubic metre—a figure only surpassed by very few rivers in the long list given by Penck.†

In times of flood thin layers of sediment will be deposited on the banks, and the bank woods will retain any flotsam as well as dead leaves and branches. Thus the level of the plain near such a bank wood will be continually raised until it is above the reach of ordinary floods. As soon as this happens, the bank woods will give way to the regular pampas flora, because the climate is so dry that grazing animals would conquer the wood. But, as in Chile, the presence of man and domestic animals makes the natural sequence of events very difficult to follow. The banks are, however, gaining ground and increasing on the estuary side. Mudbanks, just covered by water, extend in some places for a considerable distance. Upon this mud a shallow-water colonist, *Eleocharis bonariensis*, establishes itself: its rhizomes tie down the mud, which would otherwise be shifted at every tide; its slender stems are so close together that at first sight it resembles a grass sward. Upon this, mud again accumulates, and the level gradually rises until it is above ordinary tides. Then other plants begin to fix themselves in the Eleocharis—first a minute Hydrocotyle, and then a peculiar composite *Spilanthes stolonifera*, well adapted by its rooting prostrate branches to assist in fixing down the soil. When the soil-level is distinctly above high water, grasses, bulbous plants, and eventually the trees of the bank wood colonize and settle it.

A deep-water colonist was also observed in bays and along some of the smaller tributaries where there is neither a strong current nor violent tidal action. The plant *Scirpus montevidensis*, Link., grows in water 1 to 2 feet deep, and resembles *S. lacustris*, var. *Tabernæmontani*,‡ which on the Clyde acts in a very similar way. The Argentine reed

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* Galeriewald in German authorities.

† Penck, 'Morphologie der Erdoberflache,' 1894.

‡ Scott Elliot, "Formation of New Land," etc., *Annals Andersonian Naturalists' Society*, vol. 2, p. 62.

is a vigorous sturdy plant, often 5 feet high, and its stems will intercept all floating material and silt. Besides its action on the shores of the river, this plant is probably of importance in filling up disused river-beds and lagoons. Two grasses appeared to be "bank-foot colonists" in such places. One of them, a tall handsome grass, *Panicum grumosum*, Nees, acted like our British Phalaris; whilst the other, *Rottbœllia compressa*, Linn. fil., resembled *Glyceria fluitans*.

Other marsh-filling plants noticed were *Eryngium paniculatum*, 4 feet in height, and also a Sagittaria. In shallower ditches *Pontederia cordata*, *Polygonum*, spp., and other plants were observed. Eventually all such disused channels would be filled up by rich soil with abundant humus.

FIG. 6.—BACKWATER NEAR TIGRÉ, BUENOS AIRES.

I feel, however, that the lagoons and marshes in the Argentine would require a much more detailed study. In addition to the above, rushes 8 to 10 feet high,* bulrushes, and phragmites are of great importance. The pampas grass appeared to me to occur round the outer edge of lagoons and marshes in the sort of position where one would, in this country, expect *Aira cæspitosa*.

Both in Chile and in Argentina the process of forming alluvial flats and winning new land appears, in its main outlines, to be closely similar to that described in other temperate regions. In Finland,† in the

* Burmeister, 'Descript. Phys. de la Rep. Argentine,' vol. 1. 1876.
† Hayren, 'Acta Soc. Fauna et Flora Fennica,' 23, No. 6, 1902.

Jura,* and in other places both in Europe and North America,† there is but little difference in the method, though the plants acting are by no means identical.

There is, I think, no dispute as to the importance of this action of plants, and I will venture to make certain suggestions, or, rather, deductions. It is only by observing the way in which reeds and marsh-filling plants intercept both floating material and silt that one can get a clear idea of the formation of the pampas, "la marne diluvienne plastique et assez dure," which may be in places 40 to 60 ‡ or even 75 feet thick.§ Darwin describes it as a dull reddish, slightly indurated argillaceous earth or mud.‖

When the process of pampas formation first began, the conditions must have been very different. The Pampean sea would occupy the whole of Argentina between the foothills of the Andes on the west, the Patagonian highlands and the Ventana and Tandil on the south, and the Bolivian and Uruguayan highlands on the north. At that time, then, rivers would be deploying into the Pampean sea all round its coast-line, and a country of marshy alluvial flats, with deltas, lagoons, and riverside woods, would extend all round the shores—that is, for double the width (10° of longitude) of the Argentine Republic, and for about 10° of latitude from north to south. The approximate length of the coast-line from Montevideo to the gulf of St. Matias may be taken as 6800, or, including the Sierras Ventana and Tandil, 7400, statute miles.

The rainfall at that time would be, on the eastern side of the Andes, at least equal to that at Buenos Aires to-day (about 30 to 40 inches),¶ and the Chilian or Pacific rivers could not then have interfered so seriously with the water-supply of the Atlantic or Argentine rivers. Such an enormous extent of rich marshland and alluvial flats, also extending up the Patagonian rivers, would be an ideal pasture-ground for the glyptodonts and other huge extinct mammals. I assume that their diet was similar to that of the hippopotamus, capybara, or tapir.

A very frequent accident, often terminating fatally, would be for a *Mylodon gracilis*, or other beast, to become stuck or mired in the bogs or muddy lagoons. When, however, the process of pampas formation had gone on for a considerable time, the area of suitable food would become enormously diminished, and for several reasons. The length of the coast-line of the Pampean sea would diminish rapidly; it would pro-

* Magnin, "Récherches sur les lacs du Jura," *Rev. Gen de Bot.*, 5, 1893.
† Warming, 'Lehrbuch d. Œk. olog. Pflanzengeographie.'
‡ Burmeister, *loc.*
§ S. Roth, *Zeit. d. Deut. Geol. Ges.*, 1888, p. 375.
‖ 'Geological Researches.'
¶ Herbertson, Bartholomew Physical Atlas, plate 21.

bably also break into separate deltas or marshy districts; the western parts of the pampas would also become more arid as the rainfall shifted eastwards; the Atlantic rivers would shrink in consequence of the capture by the Chilian rivers of their headwaters.* The existence of these giant mammals would thus become more precarious.

When, as at present, the process of pampas formation was confined to the La Plata estuary north of Buenos Aires, the absence of these creatures is exactly what one would expect. They have died out because their food-supply has shrunk to very small dimensions. This suggestion does not involve *débacles* or any very marked change of climate, but I think it affords a reasonable view of the formation of the pampas and of the extinction of those extraordinary animals which once abounded therein.

Before the paper, the PRESIDENT: Prof. Scott Elliot, who is best known in the world of science as a botanist, has hitherto come before our Society in connection with scientific work in Africa; and in that term, as a geographer, I include the neighbouring island of Madagascar, although it is distinct from Prof. Scott Elliot's point of view, the flora and fauna being different from those of the continent. Prof. Scott Elliot passed two years in South Africa; from there he went to Madagascar, at a time prior to the French occupation. Later on he accompanied the Anglo-French Commission of Delimitation at the back of Sierra Leone, up to the sources of the Niger. Not long afterwards, he made his most celebrated expedition, that of 1894, to the regions around Ruwenzori, which were in those days almost unknown. I dare say some of you may remember the high praise bestowed upon him here by Sir Henry Stanley. Probably many of you also read the book he published on that expedition, which was carried out on behalf of the Royal Society, although our Society had the honour of contributing to the cost. I ought to say, whilst on the subject of contributions, that most of Prof. Scott Elliot's work has been carried out at his own expense. To-night he is going to take us to a very different part of the world, the regions lying on either side of the Andes. Much of his address will be devoted to Chile, that highly civilized country whose minister to the court of St. James we have the honour of having with us to-night. But Prof. Scott Elliot's address will be none the less interesting because it does not deal with new exploration. It deals with an equally important subject, namely, the effect on the geography of a country of its botanical phenomena. I will now leave him to speak for himself.

After the paper, Sir THOMAS HOLDICH: I think that the action of plants in changing the geographical configuration of the land is much more important than has hitherto been recognized. The most notable instance of it that I can recollect will be tolerably familiar to all those who have read Sven Hedin's account of his journeys in Central Asia. In Central Asia there is a vast lake, Lob Nor, which has left its old position (which was correctly marked on the old Chinese maps) and has actually migrated some 80 miles to the south, entirely influenced by the action of the water-plants. These have gradually died down, left their *débris* on

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* Cf. Dr. Evans, *Geographical Journal*, December, 1903, and paper before the Research Committee. I cannot find that he denies the existence of this river capture, or that the cause here assigned to it has been of some influence.

the lake-bottom, and gradually destroyed the level of the great flat floor of that part of Asia. This is an instance where the action of the water-plants has been entirely destructive; an ancient civilization has passed away, cities which stood on the edge of the lake are now desolate, roads are deserted, and the sand has gradually encroached and enveloped a large area which was once the great centre of Buddhist civilization. It is not always, however, that the action of vegetation is so entirely destructive; it is, perhaps, more frequently retentive in its action. Taking, for instance, the story of the Indus in India. There is no doubt that the destruction of the ancient forest which once bordered that river has determined a change of its course for over some hundreds of miles, and laid waste an area of country the extent of which it is almost impossible to calculate. And even in the Indus, as it now is, any one from year to year can watch the extraordinary change that takes place in those parts of its course where there is no retentive action of trees and plants. Where, on the other hand, there are large plantations of tamarisk, as there are towards the south, there we find the river gradually being drained into one constant channel. It has now become useful for irrigation purposes, and large areas of land which were formerly unproductive are now being gradually brought under cultivation. But, to pass from India to South America, I can quite bear out all that Prof. Scott Elliot has said about that very remarkable region near Buenos Aires which is known as Tigré. It is within the memory of the present inhabitants of Buenos Aires that all the delta land between Las Palmas and the main channel of the river was once covered with indigenous forest trees so thickly as to afford cover to the spotted jaguar, which has originated the name—Tigré. But, at the same time, I cannot help thinking that there has been a great deal of artificial assistance in changing the face of that country. Ditches and canals have been cut, connecting the different estuaries of the river, some of them of considerable depth, some so shallow that it is difficult to push a boat through; and the net result of it all is, that a large area of country has been reclaimed which has now become the great fruit centre of the country. Moving southward from Buenos Aires across the region of the ancient Pampas sea, it requires no great stretch of imagination to conjure up such a scene as Prof. Scott Elliot has given us; a landscape of swamps and morass, hedged about with forest trees here and there, through which there wandered gigantic prehistoric creatures, presenting a picture sufficiently gruesome certainly, and yet fascinating enough to induce a wish that one could have a look at it now. But when we cross from the Argentine side of the Andes to Chile, it seems to me that plant-action in altering the geographical configuration of the country must be very much restricted, for there is not the opportunity for it. Chile, as you can see in the map, is a long narrow maritime country, with all the rivers running transversely across it to the sea. Where they are environed by mountains there is very little opportunity for a change in their course; it is only for a short distance, when they emerge into the flat plains, that the action of water-plants can very well take effect. As far as my memory serves me, in the extreme south of Chile, many of the rivers run through deep gorges, cutting through the land, almost from their debouchment from the hills. Having once carved their way downward, I hardly see how any action of vegetable growth on their banks can very much change their course. In Central Chile, where the big rivers run out on to a flat floor, as, for instance, the Mapoche river—the river of Santiago—there doubtless is the opportunity for a considerable local change of course. Land reclamation occurs, and alteration generally, by means of cultivation contingent on the original growth of such vegetation. Anyhow, the final result is that these lovely valleys are produced to which Prof. Scott Elliot has referred, valleys so beautiful, as regards landscape beauty, that I can only compare them to what I have seen in Kashmir;

in fact, at almost every turn of the road in some parts of Chile I have seen views which reminded me of the loveliness of that far-off country at the foot of the Himalayas. I think I can do no better, in conclusion, than echo the sentiments expressed by the learned professor: If any of my friends wish to spend a happy winter out of England, they cannot do better than spend it in Chile.

Colonel CHURCH: Only a professional botanist can properly discuss this subject except perhaps in a general way, and while I have followed Prof. Elliot in his extremely interesting and instructive paper about the Chilian rivers and plant-action in various manners, and have seen many Chilian streams, and others further north than Chile, as far as Equador, where the same process of plant-growth was going on, and where, on the eastern side of the Andes, it is observable to a still greater degree, I still think that too much is attributed to it in the permanency of river-valleys, especially in those of Chile, where the action of the rivers and storms is so violent. But, with Prof. Elliot's permission, let me speak of the eastern side of the Andes, the Pampean sea, the prehistoric mammalia, and the Pampean formation. If I differ a little both from Prof. Elliot and Sir Thomas Holdich I may be pardoned, because I have given it, perhaps, more detailed study than those gentlemen. Firstly, I want to point out what were the limits of the Pampean sea. Its northern limit was about 19° S. lat. Its western margin was along the base of the Andes, and its eastern boundary was more or less the present western frontier of Paraguay, Corrientes, and Entre Rios. It was about 1400 miles long, with an average width of 400 miles. The amount of silt, to which Prof. Elliot has referred, carried by the river Paraná is gigantic. The mean flow of that stream equals, at least, that of the river Mississippi, which at New Orleans is 675,000 cubic feet per second, according to the careful calculations of the United States engineers. I have estimated that the La Plata carries 534,000 cubic feet per second past Buenos Aires in the dry season, but 2,145,000 cubic feet per second in flood time. Therefore, I believe its average exceeds that of the Mississippi river. The latter carries a cubic mile of silt every twenty-two years, and if we take this as the estimate of the quantity borne by the Plata river, you will see what eroding action the Plata has upon the country through which it flows. If you could turn the Plata river across the isthmus of Panamá, it would cut the Panamá canal down to sea-level in about nine months—a great pity for the United States Treasury that it cannot be done.

With reference to the mammalia which have been pictured so poetically pasturing on the bed of the Pampean sea, after its disappearance and its being left in the form of lagunas, marshes, and mudbanks, I very much doubt if the megatherium and others of the mastodon family, the remains of which are found in the Pampean districts, ever wandered round much except on the extreme margin of this ancient sea. I do not believe that these mammalia were similar in their food requirements to the hippopotamus, the capybara, and the tapir. The tapir certainly roams upon rather high ground, and is only in the water occasionally. And one of my principal reasons for supposing the gigantic mammalia did not frequent the Pampean salt marshes, is that enormous quantities of their remains are found at an elevation of 6000 or 7000 feet among the hills around Tarija in south-eastern Bolivia. If it was their custom to feed in the lowlands and the swamps, they must have gone very far from home 200 miles up the mountains to an altitude of 6000 or 7000 feet. I am much more disposed to think that they fed on the slopes of the foothills of the Andes. Moreover, among the Pampas you find only partial remains of them, as if they had drifted down from the upper waters. Those found by Darwin at Punta Alta, near Bahia Blanca, probably drifted down the Colorado river.

Referring again to the Chilian rivers, Prof. Elliot has told us that in former times they were very much larger than they are to-day; that the present ones have cut their beds through the centre of the ancient beds of former streams, as he has shown on the screen. With reference to that, when the Pampean sea existed, one may imagine that the cold polar currents swept northward over it, that the Andes acted as a great condenser, and that the enormous area of water, two-thirds the size of the Mediterranean sea, must have given great evaporation. The Andes being lower than they are to-day, an abundant rainfall must have been carried across them and have made the rivers much larger than now, and I believe that in those times Chile was a beautiful forested, garden-like country, much of which, since the drying-up of the Pampean sea and the inability of the winds to carry the rains westward across the Andes, has been desiccated. I, for one, thank the lecturer most heartily for his very interesting paper.

Dr. Evans: I cordially endorse what the lecturer has said on the importance of vegetation in determining the character of river-banks. No one, who has travelled on the great rivers of the South American plains, can fail to have been struck by the natural embankments which follow the river margins, and are caused by the filtering action of the vegetation. With regard to the part played by willows, I may mention that when ascending the Tuiche, among the north-eastern foothills of the Bolivian Andes, I noticed that the Indians pulled the raft up against a strong current with the help of the branches of the willows, that maintained their position on a submerged bank in spite of the force of the water, which must be far greater in time of flood.

It is possible that the Pacific rivers may have cut their way back in some cases in the regions referred to by Prof. Scott Elliot, but it is not necessary to invoke a change of watershed to explain the desiccation of the western Argentine plains. The retreat of the Atlantic and the elevation of the western Andes, which is believed to have continued into comparatively recent times, must have diminished the rainfall on the eastern range and the volume of the streams that flow from it. The disappearance, however, of the great mammals of South America may have been due, not to want of nourishment, but to the activity of early man, who discovered that they were good to eat.

The President then proposed a vote of thanks to Prof. Scott Elliot for his paper, which was unanimously carried.

GEOGRAPHICAL CONDITIONS AFFECTING POPULATION IN THE EAST MEDITERRANEAN LANDS.*

By D. G. HOGARTH, M.A.

It is an axiom, which no one would care now to dispute, that the geographical conditions amid which a human group resides have effects upon its character, both moral and physical, which can be recognized *à posteriori*, and even presumed; and the truth of the axiom can be, and in certain cases has been, put to the proof by variation, *i.e.* either through a particular group being transferred to new conditions, or

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* Lecture delivered at the Cambridge School of Geography, February 20, 1906.

through modification of the old conditions themselves. In the region, which is to be my peculiar theme to-day, results of both these tests are to be seen. The Kurds of Mount Amánus (Giaur Dagh) have been compelled during the past three generations to abandon the mountains for the plains, and from being feudal marauders, the terror of Cilicia and Commagene up to the early years of the nineteenth century, have become peaceful agriculturalists. Similarly, a part of the Anazeh Bedawis of the North Syrian desert, through having been enticed or forced to become *fellahin* (cultivators) in the Euphrátes valley, have lost already much of their distinctive desert character. The second test, the modification of actual geographical conditions by human agency, can be applied, of course, only on a comparatively small scale; but the effects which it exerts, nevertheless, on population may be observed in the Egyptian delta, where the reclamation of vast tracts on the western flank and along the seaboard is quickly converting the Walad Ali Bedawis and the formerly amphibious and secretive marsh folk into a slow and sturdy type of *fellah*, such as has long been characteristic of the Deltaic apex, the Fayum, and the broader parts of the middle Nile valley.

For my present purpose I propose to interpret the phrase "geographical conditions" very literally, as the *conditions of the Earth's superficies itself*, excluding influences both of what lies beneath and of what is above, *i.e.* excluding geological and meteorological conditions. The inquiry will then be concerned with the influence exerted on the population of the East Mediterranean lands by the character of the terrestrial surface, highland or lowland, plain or rugged, whether arable, overgrown, grass-bearing, or sterile; by the relation of the different superficial regions to one another; and, lastly, by their relation to the world outside the Mediterranean area. In short, in any such inquiry we must consider the characteristics of the different individual parts of a region, their facilities for intercommunication, and their general setting in the continental scheme of the globe. At the same time, far be it from me to maintain that geographical conditions are the sole, or even the main, determinant of popular characteristics. They are a factor in that determination, a factor of definite and ascertained value, which always tells. That is all that may safely be said. Many other factors go to make up that mysterious result, race-differentiation, and at some of these, perhaps the most important, we can only guess. I listened the other day to a great botanical authority speaking on the vegetation of India. He told his audience that the character of that vegetation was in certain cases sharply divided by a narrow line, although soil, humidity, weather, and climate were the same on both hands; and he added that the main factor in the differentiation remained still to be discovered. If in the world of plants there is an unknown x, how much more likely there should be one in the world of humanity! And yet

there are sane persons who will read you, to their own plenary satisfaction, all the riddles of race.

The region which I take to-day has this advantage over others in such an inquiry—that the ancient as well as the modern history of its inhabitants has been made the subject of the minutest study back to a very early period. The effect of geographical conditions can therefore be observed over an immense length of time. I mean by the East Mediterranean lands those coasts which lie round the Ægean and Levantine basins, from the Hellenic peninsula to that great projection of Africa lying over against the Morea and Crete, which was called in antiquity Cyrenaica, and is still known, with a conservatism unusual in Ottoman official nomenclature, as the province of Barca. But I shall consider the *hinterlands* of those coasts only as far back as the first strong natural boundaries, which separate them from continental masses. While, therefore, all peninsular Greece falls within our area, only that part of the Balkan peninsula is included which lies south of the line of the Balkans themselves, *i.e.* the districts of ancient Macedonia and Thrace. Asia Minor must be taken in up to Euphrates, and Syria as far east as the edge of the desert, which, when the river itself begins to bear away to the east of south, continues the boundary-line southward in a vertical direction. As for Africa, the northern edge of the desert must again be our limit, that edge running in a roughly horizontal direction from the middle of the Suez isthmus to the bay of the Syrtis, and being continuous except for the narrow pass at the apex of the Nile delta through which the great continental river issues.

This region has been characterized throughout history by a certain persistent homogeneity of population and social life, despite many obvious differences and varieties. It is not only that the inhabitants proper to certain parts of it have been found for many ages in force in all other parts as well, as, for instance, the Greeks and the Jews, and only less conspicuously the inhabitants proper to Macedonia, Thrace, Western Asia Minor, and Northern Syria; but also that most of them have had, and still keep, a curious fundamental identity of physical and moral character, that identity to which we bear witness at this day when we relegate them all vaguely to one category as "Levantine," with a common implication. It is remarkable how much similarity underlies distinctions in the facial types of the Greeks, the Armenians, the so-called Turks of Anatolia, and the Syrians. The same low-browed, slightly aquiline physiognomy is largely prevalent among all; the same dark colouring of eyes and hair; the same whitey-brown tint of skin. The prevailing type of intelligence and of temperament is also curiously identical throughout the area, the former singularly alert, versatile, and quick of apprehension; the latter sanguine, impulsive, and unstable. These things being so, it is not surprising that

the part played by all the races of this area in the history of civilization has been broadly one in kind, though differing in importance. It has been an intellectual rather than a moral part. They have contributed ideas rather than systems. What they conceived others have put into practice. They originated Christianity; but the organization of the social system and political force of Christendom was not their work. They originated Islam; but Islam again, as a social system and a permanent political force, is owed to a people of North Central Asia. They taught the arts of colonization and assimilation of alien peoples by superior races, but their own colonies did not become nations, and their empires were dissolved almost as soon as formed. We look to them for the spring of our ideas in philosophy, religion, and almost all the arts and the sciences, but not for instruction in the practical organization of society, either in its domestic conduct or its imperial expansion.

This region of the East Mediterranean coasts may be regarded, then, as a unit by no means arbitrarily presumed, and its populations as essentially, and not merely accidentally, forming one social group. And that it should be so possible to regard them is due in no small measure to geographical facts. First, of course, to the characteristics of their peculiar sea. No other in the world has so long and so uniformly united, rather than divided, the inhabitants about it, as that which is loosely termed the Levant. If I may bring archæology into court for a moment, the most recent investigations into the pre-historic period of the Ægean open up an ever receding vista of intercommunication between the distant coasts. The old-fashioned idea that the Nile valley was a land closed to Mediterranean intercourse and influences until, at earliest, the time of the Saitic Pharaohs, has not stood the test of Ægean excavation. When Egyptian objects had been found at Mycenæ, it remained still possible to ascribe them to Phœnician carriers. But Crete showed us not only actual Egyptian objects, but an Egyptian influence upon the later Minoan art of so strong and general a kind that it cannot be explained by anything less than direct, long-continued, and constant intercourse with Egypt itself in the period of the eighteenth dynasty, and earlier. Nor is it a case only of Egyptian influence in the Ægean; we have to note also Ægean influence in Egypt. Pottery of the late Minoan or Mycenæan Age has been found in large quantities as high up the Nile as Tell el-Amarna; and evidence has accumulated in recent years to show that there was a fabric of native imitation of Ægean vases—note the importance of counterfeit fabrics as evidence of strong alien influence—in all parts of Egypt, from the Delta up to Thebes, in and after the thirteenth century B.C. Not that it should be supposed for one moment that this mutual intercourse between the Mediterranean and the Nile valley began only then. The discoveries of Cretan vases in Egypt go back through the twelfth

to the earliest dynasties, and the Egyptian fabrics found in Crete suggest an even earlier age of intercourse, possibly prior even to the dynastic period on the Nile.

A close connection between Crete and the Philistine shore, already attested by Greek traditions of Minos, and the cult of Zeus Cretagenes at Gaza, is beginning to be illustrated by the results of excavation on South Palestinian sites. Mr. McAlister, the explorer of Gezer, has found fragments of painted ware which are pure Cretan of the later Minoan fabric, and also native imitations of the later Ægean forms. On the opposite side of the area, we find evidence in Sikel tombs of long intercourse between the Ægean and Sicily, this again supported by Greek traditions of the Cretan Minos. While, as for the Ægean area in and by itself, nothing is better established and more remarkable about the remains of the *later* prehistoric period, wherever found, whether in the Argolid, in Thessaly, in North-West Asia Minor, in Rhodes, or in Crete, than their identity in form and fabric. There must have been at the least free and constant commercial communication between all the mainland coasts and islands, even if the whole area had not come under one political government at the latest period of Minoan art.

The characteristics of the Levant sea, which favour commerce, have often been insisted upon. The chains of insular refuges which stud the northern part of it, and are due to the fact that the bed of the Ægean sea proper is a comparatively recently and slightly submerged continental shelf, are familiar to any one who has ever seen the map. The abundance of natural harbours, especially on the coast of the Hellenic peninsula, the Ægean isles, and western and south-western Asia Minor, needs no more than to be recalled to the memory of an academic audience. But I may point out, in addition to these well-known facts, that the tideless nature of this sea, taken in combination with certain other circumstances, has greatly conduced to its facile use by man. It is far less affected by currents than the oceanic seas; and, since it acts much less erosively on its coasts than most others, comparatively deep water can be counted upon at almost any point desired, except at a river mouth. Although the East Mediterranean is stormy enough at a certain season of the year, there is a long period, covering late spring, all the summer, and almost all the autumn, during which the direction and strength of the daily winds can be foreseen with certainty, and the nights offer recurring intervals of calm. In consequence, ships, even modern steamers of considerable tonnage, by choosing their season, can and do dispense with harbour shelter on the Levant coasts to an astonishing degree. All who have been in Greek seas must be familiar with the spectacle of large craft riding at anchor in the open close in shore, or tied up astern to the rocks themselves; and I can quote a very actual illustration of the influence which this peculiarity of the tideless Levant exerts. It appears that the

expenditure which we have incurred on the construction of a harbour for Cyprus, and a railway to feed it, promises to be exceedingly unremunerative. Captains find it unnecessary to spend money and time on obtaining berths within the Famagusta breakwater; tramps anchor outside, and in nine days out of ten can take their cargo and passengers aboard; while other steamers, specially chartered to ship the products of the island, choose their season and tie up to the open shore at the spot most convenient to the place of production.

One coast of the Levant sea must, however, be excepted at the present day from this generalization, viz. the African. As things are now, the greater part of it is as inhospitable as the other coasts are accessible. If it were not for the artificial harbours made in recent times at Port Said and Alexandria, large modern ships would have to avoid this coast altogether, and small craft could only venture to run to a few points upon it at certain seasons. The two Nile mouths have become very difficult of entry, and except the small, remote, and desert-ringed harbours of Tobruk and Bomba, in ancient Marmarica, there is not a port or a roadstead of even moderate security between Alexandria and Sfax, in Tunisia, a stretch of over 1000 miles of iron-bound coast. This has not, however, been always so, nor has the character of the African shore always exercised its present influence. There has been a serious land-subsidence, probably along the whole coast, since antiquity. The fact is fully established in the Nile delta and in the Cyrenaica, and may be assumed on the intervening almost unexplored stretch. The Ptolemaic strata of ancient Alexandria are now well below sea-level in all the lower lying districts of the city, and Prof. Petrie, when he tried, in the dry season of spring two years ago, to explore the mounds of Buto, found that the water stopped him at the level of the Roman imperial age. The culture of the olive and vine, once prevalent all over the lower delta, and attested by deserted presses and rotting roots, is now impossible; for so little do the lands rise above sea-level, that adequate natural drainage cannot be obtained. On the Cyrenaic coast, on a calm day, you may see at Marsa Susa, the ancient Apollonia and chief port of Cyrene, the foundations of half the city running out under water. Tombs sunk above the tops of their doors have become sea-caves, and the waves wash into the orchestra of the theatre. Thus the bays which once enabled Cyrene to be a commercial city of the first rank have wholly disappeared; and this geographical change has resulted in the lapse of all Cyrenaica to barbarism. Nomadized by the influence of its desert *hinterland*, it has been for a thousand years, and is still, almost the least-known and most anti-European bit of the whole African coast, although it faces the southern cape of Greece at a distance of not 300 miles, and seems placed by Nature to be a focus of Mediterranean trade.

The lands about the Levant sea, with the sole exception of Egypt,

have this also in common, that no river, navigable from the mouth upwards, acts as a natural link between the littoral plains and the inner country. Indeed, from one cause or another, there is no stream falling into the eastern Mediterranean, except the Nile, which can be ascended for as much as 25 miles from its mouth. Moreover, the littoral plains are backed in almost every case, at a very short distance, by the steep faces of high plateaux, fenced from the coast by rims of greater elevation and more rugged character than their own surfaces. This is the case, for example, in the Peloponnesus, where the Arcadian plain is completely ringed, and itself greatly elevated; and so too in Boeotia and in Thessaly, though the central plains are much lower. In Macedonia the littoral plain of the lower Vardar closes in at the Iron Gates; and the northern part of the great central Macedonian basin both lies at a much higher elevation and is effectually cut off from the southern. The same is the case with the Struma valley above Seres; while the third of the great river valleys which make up Macedonia, that of the Nesta, is shut in by high mountains till within a short distance of the sea, and only opens out near the headwaters. That Asia Minor follows the same rule is notorious. The whole heart of the peninsula is a cup-like plateau, fenced on all sides by high rims, through which the waters from its uttermost fringes, which alone drain to the sea, find their way by gorges that sometimes, as in the case of the chief Cilician streams, the Seihun and Jihan (Sarus and Pyramus), are impassable by man. So again with Syria. Two-thirds of it is a plateau cut off from the sea by high ranges. That part of the inner drainage which finds its way to the coast, does so only through the tremendous gorge of the Asi (Orontes) below Antioch, which the natives in ancient times compared to Tempe, and the gorge of the Litani (Leontes) near Beirut. The rest, unable to reach the sea at all, is consumed internally in the great salt marshes below Aleppo, and the deeply depressed evaporation-pan of the Dead sea. The exception offered by southern Palestine, where there is no distinct coastal range, is only apparent, for the plateaux of Samaria and Judea are a continuation of the highlands of Lebanon and Galilee, and so greatly elevated as to differentiate the interior from the littoral hardly less effectually.

The effect of this disposition of the land-relief round three sides of the area has always been to deter the inhabitants of the littorals from spreading on to the interior districts, and to force their surplus energies on to the sea, whose influence would obviously tend to give them a common character, while the internal peoples retained their distinct individualities. And the exception of North Africa has been of very little moment except to itself; for the portions of it habitable by any but a very thin population, necessarily dependent on the sea, are limited to two small patches, the Nile delta and the Cyrenaic highlands.

As a whole, the East Mediterranean lands may be said to have always been peopled by two distinct circles of inhabitants, an inner ring living under easy climatic and agricultural conditions and in constant intercommunication, characterized by that mobility and alert intellectualism, which comes from continual racial fusion and the habit of seafaring; and an outer ring, living under the sterner conditions of high altitudes in a temperate clime, of slower intelligence, but stronger physique and more serious and consistent habit. At the same time, while the natural distinctions of relief have been everywhere potent to deter the inhabitants of the warm lowlands from climbing up to the cold highlands and assimilating their folk—a potency well illustrated by the failure of the Arabs to make any permanent impression on the plateau of Asia Minor, despite many attempts,—they have not been strong enough to prevent the highland folk from following their natural instinct to go downhill to the warmer, kinder littorals. There has accordingly been a continual infusion of fresh and vigorous blood into the coastal populations, and a continual pressure upon these which has increased their natural tendency towards movement and change. I take it, this has had no small share in producing that singularly mobile and alert intellectual character which we associate with both the Caucasians and the Semites of the nearer East.

It might be objected here, that such a continual drain from the highlands of the interior without compensating reflux from the littorals would tend to depopulate the former districts. Well, that has to some extent been the actual result. It is obvious to the most rapid observer that the inland parts of Asia Minor, for example, had a far denser population once than they have now. Great towns which have diminished to small ones, and small towns which have shrunk to villages, or become wholly desolate, are the most frequent and familiar sights which the traveller has to observe in that country. And, more than that, a great part of such population as actually exists in inland Anatolia is of recent importation, being composed of, or derived from, Turcoman semi-nomadic races, which we know to have come into the peninsula since the Christian era. But there are many other causes contributing to this state of things—long ages of predatory warfare, native neglect to maintain vegetation, bad economic government from without, and so forth—causes so many and so dynamic that the wonder is rather that the country should be so well inhabited as in fact it is. Nor would it indeed be so if it were not for another geographical influence, to which I will now call attention, because it not only goes far to explain the persistence of population in the highlands, but also supplies another cause for the distinctive vigour and nimbleness of the intelligence of certain East Mediterranean littoral races—I mean the influence of the great steppes and deserts which form the *hinterland* of about half the area under discussion.

The effect which the vast dry and elevated tracts of central and south-western Asia and northern Africa have had on the history of the Mediterranean lands, and on that of all central and southern Europe, can hardly be exaggerated, and might well have been made the sole subject of this lecture. For it is to their existence and to their characteristics that is due that continual movement of peoples which we can dimly descry in full action at the dawn of history, and can follow in more and more detail as the centuries advance down to almost modern times. An incursion of tribes of unknown origin into the Hellenic peninsula about 1000 B.C. is the earliest of such movements of which history can take account with certainty, though it is undoubtedly very far from the earliest that occurred. The invasion of the Iberian peninsula by the Moors, and, later still, of what is now European Russia by Mongolian races, are the latest which took place on any considerable scale; while in the interval occurred the Arabization of Syria and North Africa, the Turcoman assimilation of Asia Minor and south-western Europe, and the partial Slavonic settlement of the central Balkan peninsula and Greece. Since the fourteenth century the *vacua* in Europe have been sufficiently filled up to check the indraught, according to a law which acts as naturally and inevitably as the laws governing the movement of the atmosphere and of fluids.

On natural and inevitable laws the whole question indeed depends. These great steppe and desert areas favour the growth of populations of high natality and great physical vigour, but are wholly unable to support their normal increase. The area of both pasture and cultivation is immutably fixed in a country like Arabia. It cannot be extended by any amount of human effort, and, such as it is, it but sparely nourishes a restricted and sparse body of inhabitants, which is obliged, in great part, to move from place to place to find, the year round, the bare necessaries of life. The additions continually made to the population by vigorous parents, who live in a state of society which has always allowed the male to exercise his full powers of begetting, unrestricted by monogamy, have no choice but to pass beyond the areas of their origin in a continuous stream; and, as a matter of fact, they have been so passing since the dawn of time, and are so passing still, though no longer into Europe. The Arabs have found in recent centuries their outlet in Africa; the Turcomans and Tartars, in Persia and the Far East. These movements have not always taken the same direction. India and China, and even the East Indian islands, have induced the tide of migration, as well as "the march of empire," to take its way to some extent eastward; but two facts have caused the *main* movement to tend westward. First, the existence of greater *vacua* in those western lands, whose climates, while fit for, nay, favourable to, human life, are more rigorous than the climates of the great valleys of South and East Asia, and therefore have not so quickly conduced to the growth

of population in the earliest and most feeble days of nascent mankind. Second, the downward inclination of the general Asian relief from the steppe and desert areas towards the west. In Europe, West Asia, and Africa easy natural conditions of life have always been more readily accessible to the surplus of the nomad peoples than in East Asia.

The result is sufficiently obvious. There has been a constant thrust from eastwards into the Mediterranean lands, slow, irresistible, except at moments of very strong civilized administration, such as Rome exercised for a time—and, moreover, dynamic, *i.e.* productive of secondary movements among the peoples of the invaded territories themselves. The moments of reaction have been very short, and their speedy ebb has only served to prove the rule. Consider, for instance, the great reaction of the fourth century B.C., which found leaders in the Macedonians and a hero in Alexander. It reconquered about a quarter of Asia and a corner of Africa; and how long did it hold either the greater or the lesser of its conquests? The Greeks settled in the eastern provinces of the Macedonian empire, were practising, it appears, a native religion, and speaking native tongues in less than a century. As for the territories lying immediately west of these, the Parthians had recovered them in two centuries. Even the Seleucid kingdom steadily lost Hellenism from the first century of its institution. The Aramaic element triumphed in Syria, and in inland Asia Minor we can find only the smallest traces of Greek spirit and practice before the era of Rome. Buddhism crushed the Hellenic divinities in the Far East, and Nature-worship prevailed over them in the Middle East. A creed of Semitic origin triumphed over all westernmost Asia, and passed thence to the conquest of Europe. Another creed, six centuries later, recalled most of that Græco-Semitic religious area to a purer Semitism, in which it has remained ever since. All subsequent reactions have, on the whole, failed, from Julian's attempt to Hellenise Christianity out and out, down to the efforts of modern missionary societies, which confess in candid moments that they make no impression on Islam.

The history of Syria and Egypt illustrates admirably this inexorable westward thrust of the desert populations. We read one long record of Arabization, interrupted, but never ended, by successive Western dominations. Palestine, in particular, has been continually overrun by tribes from the East, from the days when the great Mesopotamian sheikh, Abraham, made good his footing at Hebron, to the earlier part of the nineteenth century, when Ibrahim Pasha had to wage continual war with invading tribes in the district of the Dead sea, during the eight years of Egyptian occupation, from 1832 to 1840. The two greatest examples in history of such movements into Arabia are that of the Beni Israel from the southern and south-western deserts into Judea in the second millennium B.C., and that of the half-tribe of the Shammar in the seventeenth century of our era, from Nejd into the

Hamad, which, after a long conflict with the Anazeh Bedawis, already in possession, ended in the Shammar being driven across Euphrates and occupying permanently the central part of Mesopotamia, where they now are. In each case you have an example, on a large scale, of the desert surplus pressing, at a definite moment, towards a land of plenty. But even on a smaller scale the pressure is always active; and it is to stay the unrest which it occasions, that the Ottoman Government has planted a chain of Circassian colonies all down the east of Jordan, and has been labouring for the past fifty years to create an alternative place of settlement for the Bedawi surplus in the Euphrates valley, where, between desert and desert, it cannot so greatly disturb the established order of things. These alternations of Orientalism and Occidentalism in Syria, as a whole, may be detected by the repeated change of its capital. When the East has prevailed, it has been the oasis of Sham or Damascus; when the West or North, the district of the northern fertile plateau, with Antioch or Aleppo for centre.

In Egypt, our record begins with the Hyksos invasion and ends with that of the half-tribe of the Walad Ali, formerly of Nejd, concerning whom Mehemet Ali had to take measures much less than a century ago, by providing them with lands on the western fringe of the delta, after they had overrun all the north of the fertile triangle. I need not dwell on the degree to which all the population of the Nile valley below the cataracts has been Arabized since antiquity. The fact is familiar to every one in the least familiar with Egypt. But in view of an interesting book recently published in Cambridge, I may be allowed to call attention to the uniformity with which popular movement into the Nile valley from desert areas has proceeded, so far as the facts are known, from the East and not from the West, the obvious reason being the frightfully forbidding character of the Libyan waste, across which it is hardly possible to transport any live stock except the camel. Under the impulse of the first Islamic movement this difficulty was overcome by small bands, who, pressing westward, penetrated out of Egypt to furthest North Africa. But there is no recorded instance of a reflex movement. If Prof. Ridgeway wishes to derive the horses of the Pharaohs from Barbary and the horses of Arabia from Egypt, he has to get over certain very awkward geographical and historical facts.

I venture to find, in this continual permeation of desert elements into the East Mediterranean lands, some explanation of those characteristics of restlessness, superficiality, and individualism which mark the Near Eastern nature. The effect of steppes and deserts on the character of their own populations is most uniform and unmistakable, and, owing to the changelessness of the conditions throughout countless ages, supplies the best illustration of the social influence of geographical

environment which is open to our observation. The highly rarefied air, possessing apparently certain electric qualities from the friction of sand-particles; the difficulty with which mere existence is maintained; the absence of all superfluity of desirable possessions; the necessity for intense selfishness in regard to the means of life, such as patches of vegetation and hidden water-holes; the isolation of habitable spots; the isolation even of every stalk of vegetation from every other —these necessary features of desert life instil the habit of restless movement, and speedy satisfaction with the surface of things; the habit of individual action and pure self-regard; and the habit of introspection, but disconnected and illogical thought.

Finally, and very briefly—for time is getting short—I must remark upon the geographical position which this whole area of the "Near East" occupies in relation to the land-masses of the eastern hemisphere —its setting, in short, in the scheme of the globe. A glance at the map is enough to convince any one that this position is of singular importance. The East Mediterranean lands constitute nothing less than the one and only link and bridge between the three main continents of the old world. Great influence of unity though the sea may be for nations already fixed in their domiciles and advanced a certain distance along the path of progress, it is by land bridges that peoples must move in the beginning of things. By the trough of the Nile valley and the isthmus of Suez; by the main Syrian highway through Philistia to the Lebanon depression, the Orontes basin, and the fords of Euphrates; by the Cilician Gates and the Anatolian plateau, to the valleys of Mæander, Hermus, or Sangarius, and ultimately to the sea or that marine river the Bosphorus; by the great north road, which comes down the upper valley of the western Euphrates, skirts the central Anatolian steppe, and debouches by the Sangarius valley; by the routes which continue into Europe either through the Hebrus plain, or along the Thracian and the Macedonian coasts;—by these ways the populations of three continents have passed and repassed to take up their present positions— always passed and repassed! The powerful people has never remained and fixed its capital in the Near Eastern region till turned back from an attempt to push further; and, once settled, it has soon lost its power, simply because, in this thoroughfare of a world, it has never had peace to consolidate itself, never been long enough let alone. An aged Russian diplomatist once said to me that the wisest heads among his friends greatly feared that establishment of Russian empire in Constantinople to which, as he then thought, popular opinion would force the emperor; and they feared it because the Golden Horn, which would inevitably become the centre of empire, had always been fatal to the power that fixed itself there. I have since realized what he meant. The crossing of four roads is the place, not for a palace, but for an inn.

Note how the great trunk routes of the old world continued to

converge on the Near East long after the movements of whole peoples had ceased, and how they converge still. In the Middle Ages almost all the commerce between West and East passed through the Levant waters, to continue overland through Erzerum or Aleppo to Persia and China, to Bagdad and India. The discovery of the Cape route robbed those roads of their traffic, but the new highway had not been in general use two centuries before trade harked back towards the old, with the establishment of the overland route to the Red sea. Within a generation from that time the Suez canal was being cut; and now three-fourths of the commerce between West and East knows no other eastward sea road than the Levant, and, it is safe to say, will never know another. Can one wonder that commercial spirit, versatility of character, and cosmopolitan habits have been displayed more conspicuously by the peoples of the eastern Mediterranean than by any others? By the Semites of the East Levant coast, for example, first the Phœnicians, and thereafter, when Alexander had crushed these and opened a way eastward from the south-eastern angle of the area, by their neighbours, the Aramæans and the Jews? The simple geographical fact that this last people was originally located where it was, and the historical fact that it was attracted to Antioch on the one side and Alexandria on the other, will explain its wonderful subsequent history without much help from miracle. Similar qualities have been displayed by the North Syrians, the Armenians, and the Greeks, and, in a later age, by the urban populations of the Italian coasts. To be the innkeepers and hucksters of the world for many centuries is to receive enough intellectual and physical stimulus to account for even such great achievements as we connect with Palestine, Greece, and Italy; but, at the same time, it is to undergo enough exhaustion, intellectual and physical, to justify despair that the future of peoples, which have had such a history, will ever rival their past.

ANOTHER ATTEMPT ON RUWENZORI.

The following correspondence has been kindly placed at the disposal of the Society by the Secretary of State for the Colonies:—

"Entebbe, Uganda, February 19, 1906.

"My Lord,

"I have the honour to transmit for Your Lordship's consideration a copy of a letter addressed to me by Mr. Rudolf Grauer, who, together with the Rev. H. W. Tegart and Mr. H. E. Maddox, both members of the Church Missionary Society, have attempted to climb the Ruwenzori mountain, with some degree of success.

"Mr. Grauer gives the details of his ascent.

"2. I would venture to draw Your Lordship's attention to the

naming of King Edward's Rock, and Mr. Grauer's request in connection therewith.

"3. Mr. Grauer and his party have been congratulated on the success of their attempt, and informed that Your Lordship is being made acquainted with the substance of Mr. Grauer's letter.

"I have, etc.,

"(Signed) GEORGE WILSON.

"The Right Honourable the Earl of Elgin and Kincardine, K.G., etc."

"Toro, February 1, 1906.

"*From* MR. RUDOLF GRAUER,

"*To* GEORGE WILSON, ESQ., C.B., H.M. Deputy Commissioner, Uganda.

"DEAR SIR,

"I have the pleasure to inform you that our attempt to climb Ruwenzori was so far successful that we were able, on January 18, 1906, to reach the watershed of the Mubuku glacier, which is, we believe, immediately adjacent to the highest peak, called by Sir Harry Johnston, Duwoni, though we do not know of any native authority for that name. The height reached was indicated by the barometer as 15,030 feet, but calculations based on the boiling-point of water gave 14,956 feet. At this point we found an isolated peak rising out of the very summit of the snow ridge to a height of about 40 feet (total 14,996 feet), and, according to the usage of Alpine climbers, I ventured to name this, subject to approval, as King Edward's Rock. May I beg if you will very kindly sanction this appellation? And perhaps, as this is really the first peak, although a small one, to be actually reached on the Ruwenzori range, you might think it fit to report it to His Majesty's private secretary. My two companions were the Rev. H. W. Tegart and Mr. H. E. Maddox, F.S.I., both of the Church Missionary Society, Uganda.

"I enclose a list of altitudes observed,* and have the honour to remain,

"Yours, etc.,

"(Signed) RUDOLF GRAUER."

"Downing Street, March 30, 1906.

"SIR,

"I have the honour to acknowledge the receipt of your despatch No. 40 of February 19, and to inform you that His Majesty has been pleased to approve of the rock on the Ruwenzori mountain, reached by Mr. Rudolf Grauer, being called King Edward's Rock.

"I have, etc.,

"(Signed) ELGIN.

"The Officer administering the Government of Uganda."

* See p. 481.

The following communication, dated "Church Missionary Society, Masindi, Uganda, B.E.A., February 11, 1906," has been received from the Rev. H. W. Tegart, giving additional details of the ascent referred to by Herr Grauer.

"We failed to reach the highest peak, I am very sorry to say, and our failure was due to mists and want of porters to carry up sufficient outfit to enable us to camp out for a night. Even then I am afraid it would be a difficult undertaking, unless by good luck a whole day without mist was obtained. I enclose you a photo which shows the peak or rock we got to on the watershed. It took us two days to get from the permanent snow-line, 14,150 feet, to the peak; we made three ascents from our camp just below the glacier.

RUWENZORI, SHOWING "KING EDWARD'S ROCK" RISING ABOVE THE WATERSHED.

"The first day we found a road up the rock alongside the glacier, only having small spurs of ice to cross, and got to the top of ice-fall (about 100 feet below the line of permanent snow), or 14,000 feet. I am afraid Mr. Mumm made a mistake in saying he got to 14,000 feet, for he did not get out of the sight of the chief who guided him, and he

himself told Herr Grauer that he only got to the top of the ice-fall; perhaps he had only an aneroid (most unreliable things).

"Well, the second day we got to 14,650 feet, and had to turn back owing to the thick fog, and knowing that a dangerous-looking ridge was ahead of us. On the third day we came up rapidly in mist in our previous day's tracks, and then we were about four hours doing the last 400 feet. We stood for two hours in thick mist and a hailstorm within 50 yards of our rock before it cleared a bit, and we then made a spurt, and got on to what Herr Grauer, an Austrian, was good enough to name King Edward's rock,* the top of which is about 15,070 feet or thereabouts. We waited for two hours to see if it would clear sufficiently to locate the peak, which is to the right of the photo I enclose; but we had to come down, and we did not relish a fourth climb. To make a good confession, I think the three days was a strain, and we were a bit nervous on the last day, coming down over some difficult rocks. Anyhow, the weather broke, and we had two bad days coming down the lower slopes. However, that central peak can be climbed if the porterage difficulty can be got over.

"Sir H. Johnston thought the Kyanja, or knob-shaped peak, the highest, but we looked down upon it from the watershed.'

"The mountain falls away very quickly on the Congo side, and there is a very sharp ridge and a deep crevasse along it: we crossed this on a snow-bridge to get to our rock, which is about 40 feet long and 30 broad at the base, rising to a sharp point.

"I got you some specimens of the rocks, which I will send with the thermometer above. About 13,000 feet the rock looks like good trap rock, or the stone used at home for the roads; below 13,000 feet the rocks are soft, and contain a good deal of mica. The rocks bear traces of the glaciers down far below their present lowest point. I don't think there is much quartz. I could see blocks of it on the other side of the valley high on the hillside, but they were few and of small extent.

"Of the stratification, I am afraid I do not know enough to express an opinion. Indeed, we were going so hard at it that all our attention was given to getting over the rocks as quickly as possible.

"I am sorry to say that I forgot to take the certificates of the tests of the thermometers with me; we tried both at most places, and found them read exactly alike, strange to say; yet I now find that there is a considerable error compared with the standard instruments with each other. I read at the highest point the one numbered 18,867. Mr. Maddox checked my readings at every point, and kept a separate note of them. We then worked them out independently at Kabaroli, which we took as our base, using the tables in the Society's 'Handbook for Travellers.' I have not a copy, or I would make the corrections for

* The rock is in the centre of the snow-covered saddle.

error now, but this I must leave to you. We should be extremely pleased to hear if our height for King Edward's rock, in the watershed, is correct.

"Mr. Maddox thinks the height for Kabaroli, 5000 feet, is fairly correct, for quite a number of aneroid barometers have been tried, and all closely agree. Mr. Maddox's own, registering to 15,000 feet, gave the height on our list when he first came out, and also when he returned five years later. I think it is fairly certain that the highest point is not over 16,500 feet."

ALTITUDES ON RUWENZORI, B.E.A., JANUARY, 1906, FROM OBSERVATIONS OF BOILING-POINT THERMOMETER SUPPLIED BY ROYAL GEOGRAPHICAL SOCIETY, AND AN ANEROID BAROMETER (25,000 FEET) LENT BY THE BRITISH MUSEUM NATURAL HISTORY RUWENZORI EXPEDITION.

	Boiling-point.	Tempera-ture.	Difference in altitude.	Altitude.	Barometer readings.
	°	°	Feet.	Feet.	Feet.
C.M.S. station, Kabaroli	—	—	R.G.S. tables used.		—
Toro, as lower station ...	203·0	69·5	0	5,200	—
Kakindo, Mubuko valley	204·2	81·0	703	4,497	4,500
Camp at Bihanga ...	200·0	84·0	1778	6,978	6,700
Kichuchu rock shelter ...	194·9	49·5	4669	9,869	9,600
Bujongolo „ ...	190·4	45·0	7281	12,481	12{300 500
Glacier camp	189·0	43·5	8103	13,303	13,100
Base of glacier	188·5	45·0	8409	13,609	—
Top of ice-fall	187·7	40·0	8848	14,048	14,000
King Edward's Rock, Jan. 18, on watershed	186·2	42·0	9756	14,956	15,030
Height of rock above last point about 40 feet	—	—	—	14,996	15,070

Permanent snow, 14,150 feet.

Examined and found correct { H. W. TEGART. H. E. MADDOX, F.S.I.

A NOTE ON THE RUWENZORI GROUP.

By DOUGLAS W. FRESHFIELD.

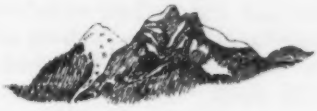
RUWENZORI has already a considerable literature of its own. I need only mention here the two latest additions to it, Mr. Maddox's account of his visit to the Mubuku glacier (Uganda Notes, June, 1905), and Mr. Dawe's botanical article in the *Journal* of the African Society for January. I may add references to the allusions to an ascent on the western side of the mountain by Dr. David in the *Globus* for 1904, and to the map compiled from Dr. Stuhlmann's observations, issued in the *Proceedings* of the Hamburg Geographical Society for 1901 (vol. 17). There is as yet no complete map of the range that has any pretension to accuracy in detail, and no attempt has been made to define and delineate its glaciers.

In one respect I was fortunate last year. From the hills near Butiti, a mission station 17 miles east of Fort Portal and about 40 from the glaciers of Ruwenzori, we had a complete and cloudless view of the range from end to end. This view was denied to our predecessors who have written on the mountain, and I shall therefore describe it in some detail.

In the immediate foreground stood bold green hills. Beyond them we looked across a rolling country to a long range rising from low foothills at either end through rocky ridges to a central comb of shining snow. The vision, welcome as it was, was rather fascinating than sublime. The precipices and icefields were not like those of the Himalayas, built up on a scale to excite awe; the general effect of the range was such as the European traveller is accustomed to. We might have been looking at a bit of the panorama from the Superga above Turin.

The first thing to strike us was that there was no possible doubt as to the highest peak, no more than there is in the case of Mont Blanc when seen from Geneva. Starting from our left, the first snow lay in streaks on a massive rock-peak I will distinguish provisionally as the Southern peak. A broad snowless depression, obviously suited for a pass, and (we afterwards learnt) used as one by the natives, separated this summit from a bold comb of rock and ice, Sir Harry Johnston's Kiyanja. Its very distinctive outline was at once recognizable as the reverse of that shown in the peak on the right in Dr. Stuhlmann's beautiful photograph of the snows taken from the head of one of the glens on the western or Semliki valley side. From its base an undulating ridge, mainly glacier-clad, stretched to the dominating summit, a shapely snow-peak of the most inviting aspect, apparently Sir H. Johnston's Duwoni. So far as could be judged from such a distance, no obstacle serious to any one with an ice-axe is likely to be found on the snow-ridge that leads up from the saddle at its southern base. Close and to the north-west was a secondary peak. This double summit is shown from the south-west in Dr. Stuhlmann's photograph, and also, I feel sure, from the north-west in Stanley's woodcut ('In Darkest Africa,' vol. 11, p. 252), under the title "The tallest peak of Ruwenzori." These views are reproduced here, together with an outline of my own taken at Butiti. Mr. Mumm's photographs from that place were, as far as the distance is concerned, unfortunately failures.

North of the highest top was a cluster of comparatively insignificant snow-spangled rock-peaks (visible also from Fort Portal), and then the chain sank into green hills. There was no indication of any second group equal in height to the central group, some 12 to 20 miles north of it, in the place where the Saddle peak is placed on maps. The Saddle peak is a Mont Iséran. The peak that was drawn under



Tallest peak of Ruwenzori from the N.W.
(Stanley)

Ruwenzori from the S.W.
(Dr Stuhlmann)

Duwoni and the Portal Range from Butiti

that name by Stairs was a minor rock summit. More recent artists have probably sketched the double summit of Duwoni under that title.

The Southern peak and Kiyanja both stand over the head of the Mubuko, and are conspicuous from it. Duwoni is invisible, at least from the valley, as it lies well to the right behind the rocky summit on the (true) left of the icefall. Kiyanja could, in decent weather, be easily climbed from the highest rock shelter.

The numerous descriptions of the Mubuko valley that are already in print dispense me from adding another in these pages. But it may be serviceable if I attempt such an outline sketch of the character of the Ruwenzori range as our present imperfect knowledge will allow. Ruwenzori has been compared to the Alps and Caucasus. Its snows have been alleged to rival those between Mont Blanc and St. Gotthard. Such phrases are misleading. Between the Simplon and the Gries would be nearer the mark. The portion of the range that is glacier-clad is something between 12 and 20 miles in length, probably nearer the lower figure. On either side it sinks through rounded forested ridges to the low foothills which make up nearly half of its whole length —60 miles.

I am sorry not to be able to agree with Sir H. Johnston as to the height of the mountain; he gives it 20,000 feet, an estimate formed from his impressions of the scenery at the head of the Mubuko valley. In considering this question we have now several data to argue from. The level of the upper terrace of the Mubuko has been shown by repeated measurements to be about 13,000 feet, the base of its glacier 13,500 to 13,600 feet. Mr. Moore and Mr. Tegart have both got heights of 14,900 feet for points on the watershed at the head of the glacier. I confess that I find it hard to believe that the rise from the valley bottom to the crest is less than 2000 feet. But I hesitate to dispute the combined observations, and I must suppose that the magnifying and distorting power of mist misled me in this case. The third datum is the height of 16,600 to 16,700 feet, obtained by careful measurements by members of Colonel Delmé-Radcliffe's frontier survey party for *a peak* of the range. The question, which we cannot decide until further details are furnished, is, Which peak?

From the south and south-west the highest peak is frequently obscured by the Southern Peak, which is several hundred feet the lower of the two, and it is very possible that the Southern Peak was the point determined. In this case the highest peak will probably prove about the height I first guessed—17,500 feet. But if the Mubuko watershed is really only 15,000 feet, it is likely to be 1000 feet lower. It must be mentioned, however, that Dr. David claims to have climbed to 16,700 feet on the western flanks of the mountain. But until he furnishes further detail, that statement must be received with reserve.

It may plausibly be argued that a range of this height, situated

under the equator, could not feed glaciers that descend to 13,500 feet. I thought so myself, until I had suffered from the rainfall and the pall of black chilly mists that hangs over the upper slopes. Perpetual humidity and scarcity of sunshine may be efficient causes for the existence of glaciers and their descent to a comparatively low level. In this connection I must refer to a statement in this *Journal* for March last, that at 3670 feet on the slopes of Ruwenzori, a temperature of 39° Fahr. has been recorded, while at 6250 feet on Kilimanjaro no equally low temperature has been observed.

The snow-line is another matter on which some of my predecessors have expressed views I do not share. A snow-line is not where snow sometimes falls, nor where it happens to lie at the time of one's visit, nor where *névé* succeeds ice. It is where snow lies in permanent beds (other than avalanche channels) all the year round. Trees on Ruwenzori grow well over 14,000 feet, and snow often lies on and among them. There is not, as in the Alps, a broad bare space between the forests and the snows. When we were in the country, the only continuous snows were those between Kiyanja and Duwoni. A few hours' sunshine, I believe, except in this basin and any similar ones on the western slope, obliterates all snow under 14,500 feet on exposed surfaces.

The Mubuko glacier wastes mainly by evaporation. The stream it gives birth to is clear, and can be stepped over. It is probably as much the outcome of a sub-glacial source as of meltings. The golden colour of the highest rocks is caused by mosses and lichens; a similar effect may be seen on the seaward side of the Maritime Alps.

Frequent statements have recently appeared in the press that the Congo Government claims the better half of Ruwenzori, including the highest peaks and the valuable salt-lake at its southern end. It may be as well, therefore, to reprint here a passage from an article by a high Belgian official in the *Mouvement Géographique* for October 29, 1905, who puts the question in what appears to be its true light, and shows that there is no reasonable ground for political controversy.

"La frontière politique qui separe l'État Indépendant du Congo du colonie Anglaisè de l'Uganda coupe le massif du Ruwenzori en deux portions d'inégales superficies : la partie nordest, la plus importante, se trouve dans le sphère de l'influence Anglaise : la partie sudouest, qui comprend les contreforts enpente vers le lac Albert-Edouard, est située sur la territoire de l'État.

"Cette limite purement géographique est provisoire : il viendra un moment ou elle devra être précisée sur le terrain par une expédition mixte. Telle quelle est elle a été fixée per diverses conventions et documents, notamment la déclaration de neutralité addressée aux puissances le premier août 1885, la carte officielle au 5,000,000 dressée par Frederiksen et annexée aux *Protocoles et Documents de la Conférence de Berlin*, enfin l'arrangement de 20 Mai 1894 conclu avec l'Angleterre.

"La limite est indiquée par un paintillé spécial sur le croquis joint à cette étude et qui a été mis au courant du dernières observations récues en Europe. A l'ouest du lac Albert et du cours moyen de la Semliki elle est formée par la ligne de faite der basins du Nil et du Congo jusqu'à sa rencontre avec le 30ème méridien: elle est continuée vers le sud le long de ce méridien qui coupe la grande forêt de l'Aruwimi à ses confins orientaux, la Semliki à peu près vers le milieu de son cours et le lac Albert Edouard à son extrémité près du poste Anglais de Katwe."

Since first writing the above, Dr. Keltie has shown me Mr. Tegart's interesting letter. It to a great extent exonerates my informants for having sent me in November. For in January, one of the months specially recommended by local experts, Herr Grauer and his companions had, it seems, five consecutive days of broken weather. There are one or two points in Mr. Tegart's letter in which he will, I trust, shortly make his narrative more definite. Mountaineers would like to know what was the nature of the difficulty which made the party spend two hours in climbing the last 400 feet before reaching their Rock? And how long did they take, exclusive of halts, from their highest camp to their highest point, an ascent of only 1000 feet? I assume, from Mr. Tegart's narrative, that the party slept at this height. It is, I think, quite certain that the summit depicted as Kiyanja by Sir H. Johnston is higher than any point on the watershed between itself and Duwoni, and therefore must be higher than the Rock. I can only suppose, therefore, either that in the mist Herr Grauer's party mistook a lower crag for Kiyanja, or else that they had previously wrongly identified a lower peak as Johnston's Kiyanja. While far from contesting the possibility of traces of ancient glacier action being discovered in the lower portions of the Ruwenzori valleys, I do not think they are so easily recognizable by the passing traveller as Mr. Tegart supposes. On this subject I shall have an opportunity to write elsewhere.

As to the height attained by Mr. Mumm and Inderbinnen, we (as I have written elsewhere) attached no importance to what was an off-day excursion. Expecting to make a serious expedition in a day or two, we took no measurements. But my companion is convinced, and he speaks with much experience, that he climbed something like 1000 feet above the glacier's snout (13,500 feet), and he adds that the statement that the local chief had him in sight *all the time* is not to be taken in a strictly literal sense, though it is quite true that he watched the climbers as far as he could with great interest.

Since the above was written I have heard from Mr. Kenrick that Mr. Worsman, one of the British Museum party, "was lucky enough to find a fine day, on which he left his card in the box placed at their highest point by the missionaries who were up there just before him."

THE GLACIAL ASPECT OF BEN NEVIS.

By VICTOR H. GATTY.

In a recent number of Symon's *Meteorological Magazine* there appeared a paper entitled the "Glacial Snows of Ben Nevis," by the Rev. R. P. Dansey, which goes to prove the existence of one or more small "glaciers," or, at all events, small ice-sheets approximating in character to glaciers, sheltered even at midsummer from whatever sunshine falls to the lot of this cloudiest of British summits, beneath the lofty precipices which form the northern face of the mountain.

To one interested in the extinct glaciers of our own country, which have left such fresh and abundant traces of their latest manifestation in Wales and the

ICE-BED IN OBSERVATORY GULLY (SEPTEMBER 18, 1905).

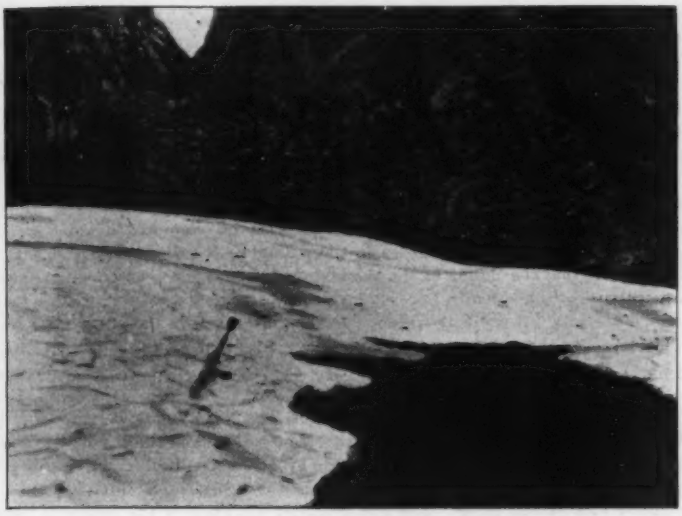
English Lake District, as well as further north, the suggestion that a connecting link taking us back to the closing period of the Glacial epoch exists in our own island in the shape of a living glacier, however small, seemed of special interest, and determined the present writer to undertake an independent investigation of the facts. Several visits to these snow or ice beds in July led to others in the latter half of September, by which time it is tolerably certain that they have reached their minimum, and that no further material decrease will occur. Apart from these snow-beds, the recesses under the cliffs in which they are found present several features which deserve attention from the point of view of this paper, and suggest a resemblance between modern conditions on Ben Nevis and those which prevailed amongst the hills of northern England in late glacial times. The following notes upon the results of these investigations may perhaps possess some interest, regarded as a contribution towards fixing the position of Ben Nevis in the glacial scale.

I must, in the first place, refer shortly to the interesting account given in Mr. Dansey's paper of these snow-beds, which he says have never been quite melted away within living memory. After noticing the causes which favour the accumulation and duration of snow on the northern face of the Ben, rendering it the one summit in the British isles where "you will find your semi-glacier, if at all," Mr. Dansey quotes an account by the Rev. A. E. Robertson of a visit made last year to the (then) largest snow-bed. "Mr. Robertson crossed the largest 'glacier between the Observatory ridge and the north-east buttress . . . in August last (1904), and said the length of the 'glacier' from top to bottom was then 300 feet, and that it was of an average breadth of 50 yards, hard as a board, ribbed just like the *névé* in the Alps. He considered that it would not melt much more, if at all, that year. In many places at the side he could look over the bergschrund between the rocks and the snow, and could see down a great way, in many places 50 feet." Mr. Robertson concludes that if it was 50 feet at the sides, it must have been much more in the middle, and makes the interesting suggestion that these beds will show glacial movement if watched.

My first day in the Alt-a-Mhiulinn glen was devoted to an examination of this same snow-bed, and since it is the first to which attention has been specially directed, I will first of all deal with it, although, as will be seen, appearances in this case proved deceptive, and interest attaches chiefly, not to this, but to another snow-bed, which I shall refer to later. On July 21 (1905) I found the bed much as described by Mr. Robertson in length, but hardly so wide; the bottom could be seen down a gap between the snow-bed and the rock on one side. It there appeared to be some 20 feet in thickness, and it seemed reasonable to assume that in the middle the depth would be considerably greater. The snow appeared to differ little throughout the mass, and, so far as it was visible, showed no approach to compact ice even at the bottom. The stream issued from a small cavern at the foot of the snow-bed in much the same way that the water from a glacier is usually discharged, a characteristic common to all the snow-beds I examined. There was no appearance of the formation of a moraine, and I could find no indication of any material movement of the mass. It is not necessary to describe this snow-bed more particularly, since at the time of my last visit to the spot on September 16 the snow had entirely vanished. It is most probable that this was an exceptional year in that respect, and that in most years this snow-bed remains unmelted; the fact, however, that it had entirely gone this year places it at once outside the category of glaciers.

It could now be seen that the formation of the ground had given an appearance of depth to the snow which it did not really possess, a narrow rift in the rock some 20 feet deep at the side of where the snow-bed had lain had caused the depth of snow at the extreme edge, where it could be seen, to be very much greater than elsewhere.

The disappearance of the snow-bed, however disappointing to one's hopes of finding it to be in truth a little glacier, afforded an opportunity of examining the underlying rocks, which (judging from the condition of the snow in August, 1904) had most probably not been uncovered for a period of nearly two years at least. On several I found scratches (not grooves), all in an up-and-down direction. One rock in particular bore a number of fine scratches, evidently made by sharp chips of stone, which still lay on the rock and themselves bore traces of friction. These chips had clearly been dragged across the rock under pressure. The scratches made by them are thus clearly of the nature of incipient striations, but whether caused by a gradual movement of the snow or by a sudden slip in the last stages of melting it is impossible to say, and it would be unwise to base upon them any



FOOT OF ICE-BED IN OBSERVATORY GULLY AND MOUTH OF TUNNEL (SEPTEMBER 18, 1905).

suggestion of a movement of the snow-bed analogous to that of a glacier; nevertheless, their presence is interesting, if only as an illustration of one of the phenomena of glaciation in an incipient stage.

The one other snow-bed I shall describe is that which lies in the Observatory gully, some 600 to 800 feet below the summit of the mountain. This bed was examined in July by Mr. Dansey, who drew my attention to it; he described it as being of exceptional size, and I thought it probable that this, and the high and sheltered position in which it lies, might have enabled it to withstand the influences to which the lower bed had succumbed, and this proved to be the case. The day of my visit, September 18, was one of those exceptional days, when fog lies thick below and the summit pierces through into blue skies and sunshine above. The snow-bed lay just on the dividing line, and from it could be seen from time to time the summit of Carn Mor Dearg, bathed in sunshine across a thick white bed of fog. Around the gully itself only the topmost crags were touched by sunlight, the precipices rising so abruptly that no direct sunshine can ever reach the bottom. This snow, or rather ice bed, which lies at a height of 3600 to 3800 feet, was still of considerable size, perhaps 100 to 150 yards by 60 yards, excluding narrower projections, with a fall of some 200 feet from top to bottom, and a thickness varying from 5 feet at the lower end to 10 to 12 feet at the top. Very little true snow remained; the greater part of the mass was ice of varying degrees of hardness, only the surface being at all easy to cut into. At the bottom end there was as usual an opening into a tunnel (in this case 4 to 5 feet high), formed no doubt by water at the time of snow-melting; the lower part of this arch consisted of clear ice of a considerable degree of hardness, a trial showed that twenty strokes at least with the pick end of the ice-axe would be required to cut a step in it.* The ice diminished in hardness up to the surface, but was compact

* This, from an Alpine point of view, means tolerably hard ice, not *névé*.

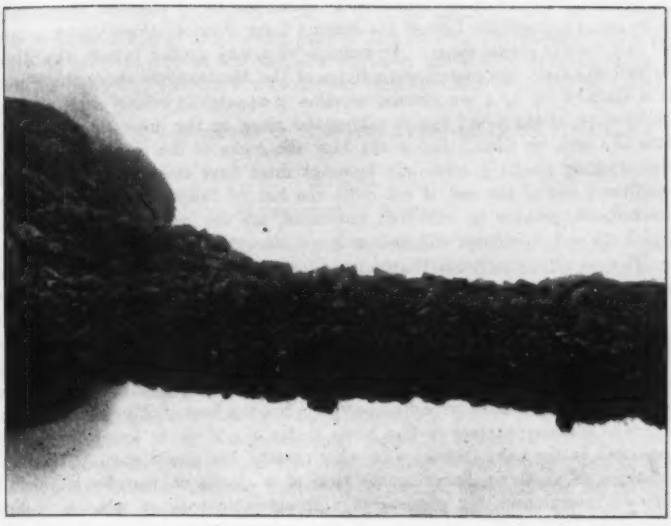
all through, only the last 2 or 3 inches being at all loose. The upper part of the bed was curiously supported for some distance in on arches and pillars of ice, resting on the rock, formed apparently by cross-tunnels.

The consistency of this mass of ice makes it tolerably clear that the lower layers at least were more than one winter old, and its hardness makes it certain that there would be no appreciable further diminution this year. Though there does not seem to be any sufficient warrant on which to base the view that this mass of ice is in reality a small glacier, it can, I think, be seriously regarded as the first small beginnings of one, and it seems not improbable that a few winters of exceptional snowfall would considerably increase the resemblance.

A record of growth or decrease in succeeding years would be valuable. It is unfortunate that the closing of the observatory on the summit, and the consequent interruption of the records, make it no longer possible to ascertain whether these snow-beds vary directly with the snow fall, as do glaciers in the main, or whether they depend rather on such chance occurrences as avalanches or drifts. In the particular season under review, I believe the amount of unmelted snow was exceptionally small.

The widest bend in the northern cliffs of Ben Nevis contains the Corrie na Ciste, a broad semicircular hollow with steep gullies branching out at various angles. Apart from the snow-beds, which by September had reached small proportions in this corrie, there are two features of considerable interest from the point of view of this paper. The first to attract attention is the enormous size of the *débris* fans, some 700 feet high, which run down from the various gullies; these fans consist of broken rock of various sizes ranging up to boulders, and the fact that much of it shows fresh fractures and bruises is good evidence that active growth is still going on.

MORAINIC DAM, CORRIE NA CISTE, OF RECENT FORMATION (JULY, 1905).



MORAINIC DAM, CORRIE NA CISTE (FROM ACROSS THE TARN, MIST BEHIND).

Further south, amongst the hills of the north of England, such talus fans consist for the most part of old weathered material, the output of a past period of greater climatic severity, and to-day receive comparatively small additions. To take an instance, there is in High Cup Gill (a ravine of the Pennine range west of Appleby) a large old *débris* fan which forms the "cup" from which, no doubt, the gill is named; this fan has long since ceased to receive material additions, and probably dates back to the period when small glaciers were depositing the hill moraines of the English Lake District. If I am right in this conjecture, we seem to have to-day on Ben Nevis precisely the climatic conditions which moulded that Pennine valley in the closing period of the Ice Age.

The most interesting feature in the corrie is, however, a semicircular embankment in process of formation which, if not strictly a moraine in the usual sense, clearly owes its existence to ice and snow, and can only be classed amongst morainic formations.

At the foot of the corrie is a little tarn of remarkably clear water, with no apparent inflow and no visible outlet. On the upper side, the *débris* fans from the gullies above shoot right into the tarn, whilst the lower side is enclosed by a semicircular embankment rising some 6 or 8 feet above the water-level. This dam is built up of stones of all sizes, from pebbles to blocks 4 feet across. Some of these had plainly fallen last spring, and one in particular I noticed quite on the top of the dam, a block of volcanic rock some 2 feet 6 inches across, showing a recent fracture with sharp edges, and bearing still quite fresh the bruises received in falling.

The way in which the dam seems to be forming is this: in the spring a tongue of snow projects over the site of the tarn, and terminates against the dam; blocks of rock wedged off the cliffs above by the winter's frost roll or slide down and come to rest at the foot of the snow-shoot, and so build up the dam.

Several instances of old semicircular embankments of identical formation are to be found amongst the hills of the English Lake District; these almost certainly all date back to glacial times. An example of a very similar tarn in the Alps is to be found under the eastern snow-slopes of the Muttenhorn (above the Furka): it is dammed up by a semicircular moraine of apparently exactly similar origin—an ice-slope, at the time I saw it, taking the place on the inner side of the talus fans of Corrie na Ciste. Below the tarn the rocks of the corrie are scored by fresh-looking glacial grooves cut by what must have been, judging by modern conditions, one of the last, if not quite the last, of British glaciers whose direct descendants, perhaps in unbroken succession, are the patches of ice and snow which the end of summer still finds amongst the crannies of the rocks above.

To sum up, in conclusion, the results of these investigations. There is abundant evidence that frost and snow are still yearly doing work, both destructive and constructive amongst the northern cliffs and gullies of Ben Nevis, which has probably had no parallel amongst the hills of Northern England since glacial times, and in its condition to-day it seems likely that we have reproduced the state of things which obtained amongst the hills of the English Lake District just as the last of the glaciers were disappearing. Not the least striking suggestion that this is so is the appearance on Ben Nevis to-day of a morainic formation of a type associated in the Lake District with other relics of the glacial epoch. Whilst the existence of anything deserving the title of a glacier on Ben Nevis would be difficult to maintain, the presence of a considerable body of what is probably permanent ice brings it at least into the rank next below glaciated mountains, and proves that the hand of the Ice Age has not yet lifted entirely from the culminating point of British ground.

REVIEWS.

EUROPE.

The Middle Ural.

'Materiali dla Geographi Urala, Oro-hidograficheskiya Izsledovaniya v' yuzhno chasti Srednavo Urala.' P. Krotof. St. Petersburg: 1905.

It may seem surprising that a detailed work on the geography of a region known, at least by name, for many centuries should still be needed. Yet no further back than 1882 Dr. Carl Hiekisch, in his work 'Das System des Urals,' showed that the information available on its geography was very incomplete and superficial. This want the author set himself to supply, and in the present, his first, volume treats of the geography of the southern part of the Middle Ural, extending for about a degree of latitude south of Yekaterinburg, which he explored in the year 1893. His first two chapters give a sketch of the work of former travellers in the region in question and the cartographical material already published, and three more are devoted to a full description of the orography, hypsometry, and hydrography. In this section the Urals consist of two great anticlinal folds of granite and gneiss. The western, named by the author after the Ufale river, is still a continuous range, nowhere lower than 1470 to 1500 feet, and sometimes rising to 2000 feet, while the eastern, a prolongation of the elevated zone of Mount Ilmen, is broken up by downthrows into monoclinical elevations and horsts. Between these lies the continental watershed, composed chiefly of crystalline schists, and of small relative altitude. The whole region slopes down gradually

from south to north. Evidences of marine abrasion are to be observed at considerable heights, chiefly in the eastern part of the district. Fresh-water lakes have left their marks as high as 980 feet, and doubtless the marshy grounds beside the existing lakes and elsewhere were at one time the beds of extensive sheets of water.

The volume is accompanied by topographical and geological maps and a list of altitudes.

ASIA.

Adventures in Siberia.

'Siberia: a record of Travel, Climbing, and Exploration.' By Samuel Turner, F.R.G.S., with an introduction by Baron Heyking. Illustrated from photos by the author. London: 1895.

The present volume claims to give an account of a winter exploration of the Altai mountains. It makes no scientific pretensions, beyond recording the ascertained heights of mountains, describing passes and glaciers, and placing on the map those features of the country which the author explored most carefully and considered to be least known. In particular, Mr. Turner devoted his attention to the exploration of the Katunskie Belki range, the loftiest in Siberia, where he himself claims to have reached the great elevation of 17,800 feet, and of which he gives a number of striking views. It is strange, however, that he makes no reference to the earlier travels of Elwes, Littledale, Demidov, and above all of Atkinson in the Altai regions, especially after the witness that has been borne by Ney Elias to the value of Atkinson's explorations in this country.

Besides mountain-climbing, the author also deals at considerable length with Siberian trade, and especially with the dairy industry, and discusses the relations of England and Russia in a strongly philo-Russian spirit. Baron Heyking, the Russian consul for Scotland and the northern counties of England, besides contributing a short introduction, mainly composed of extremely optimistic remarks on present-day Russian civilization, furnishes an outline of Siberian history in an appendix.

Central Asia.

'Tibet and Turkestan. A Journey through Old Lands and a Study of New Conditions.' By Oscar Terry Crosby, F.R.G.S. New York and London: G. P. Putnam's Sons. 1905. *Price* 10*s.* 6*d. net.*

It is unnecessary now to do much more by way of review than to announce the publication of this book, because in vol. 23, p. 253, of the *Geographical Journal*, a sufficient description of the author's journey was given, and it appeared that the consequent addition to our knowledge of the geography of Tibet was that supplied by the short part of his route, south of the Aksai Chin, which reached the sources of the Karakash river. Moreover, Mr. Crosby's paper, 'Turkestan and a Corner of Tibet' (vol. 23, p. 705), was duly read, discussed, and published, so that the best part of the present book is not new to readers of this *Journal*, and what is new may not be found entirely agreeable. For it consists largely of a somewhat virulent condemnation of the recent mission to Lhasa, of Lord Curzon's policy, and of Sir Frank Younghusband's mode of carrying it out, combined with a presentation of Russia in a benevolent aspect. These matters, being beyond the scope of this notice, cannot be here discussed. The volume is well got up, the errors are few and probably accidental; thus pp. 61, 62, and in index, Hoerule for Hoernle, and p. 66, Deasey for Deasy. Illustrations are numerous and interesting, and there is a general map of the greater part of Asia, on which the routes followed are laid down. W. B.

The Philippines.

'The Philippine Islands.' By Fred W. Atkinson, First General Superintendent of Education in the Philippine Islands. 8vo. Pp. 426, 2 *Maps and numerous Illustrations*. Boston, New York, Chicago, and London: Ginn & Co., Ltd. *Price* 7*s.* 6*d.*

Mr. Atkinson's book has no sub-title, and until the volume is in the reader's hands he is left in uncertainty as to its scope and the point of view the author will take up, although the fact that the latter holds the post of Superintendent of Education in the archipelago no doubt affords something in the way of clue. We have had many books on the Philippines since the American occupation. Mr. Foreman wrote from a prolonged acquaintance with the islands, and though his book left much to be desired in the way of arrangement, it was, and will always remain, a most valuable storehouse of facts for the historian. Mr. D. C. Worcester depicted the island excellently from the standpoint of the naturalist and explorer, and Señor Ramon Lala—a Filipino who had an English training and was an ardent supporter of the American rule—wrote a book which is of especial value as showing us the country and the people as seen through native eyes. Another and very different phase—the everyday life of commercial Manila—is very well realized in the unpretentious but clever little volume which Mr. Joseph Earle Stevens published under the title of 'Yesterdays in the Philippines,' and Colonel G. J. Younghusband has shown us the country as it appeared to a military critic shortly after the annexation. All these have a justification for their existence, and with Jagor, Montano, Burbidge, and others of the pre-American days, combine to furnish a tolerably full account of the archipelago. Mr. Atkinson, nevertheless, opines in his preface that "previous writers have not presented their material in such a way as to attract the ordinary reader, and enable him to get an accurate and substantial knowledge of the situation," and on this plea, combined with his experience as Superintendent of Education, offers us the present volume.

It would have been better if Mr. Atkinson had given us more first-hand material and less compilation. As it is, we get the usual chapters upon history, geography, etc., which do not add in any way to the information given in the leading geographical manuals. Climate receives a chapter to itself, and is followed by another on public health, a rather misleading title, for but few statistics are vouchsafed, and their place is taken by hints for travellers and residents on the preservation of health. These are for the most part helpful and correct, with the single exception of the author's recommendation of linen underclothing, in which we doubt if he could get any doctor with any knowledge of the tropics to join. Commercial geography is also somewhat of a misnomer for the next chapter, which speaks only in very general terms of the products of the archipelago, and makes the curious statement that "there is a conspicuous absence of palatable fruits"! And this in a land which can boast the finest mango in the world, and a pamplemousse or shaddock which is second only to that of Labuan! Writing on the native, Mr. Atkinson is more at home, but does he mean his statement that the Moros take scalps to be taken seriously? It is satisfactory to learn that the Negritos are not decreasing, and that the Bureau of Ethnology place their numbers at as many as 30,000; but it cannot be said, as Mr. Atkinson avers, that "their identity (*sic*) with the Sakais of the Malay peninsula and the Mincopies of the Andaman islands is almost certain."

The section dealing with the educational methods adopted by the Americans is interesting, and here the author is on firm ground. It is, as he says, a huge task to train six millions of tropical, indolent people for self-government; but if not spoilt by too much hurry, the outlook is not unpromising. A great difficulty was the

presence of the friars, but this is now practically solved by the American Government having purchased the real estate belonging to the different orders, while a Roman Catholic archbishop and three bishops have been sent over from America to take in hand the ecclesiastical administration of that Church. The system of teaching adopted is certainly not lacking in boldness. Starting on the basis that there is no universal tongue in the Philippines, but, on the other hand, a vast number of different languages and dialects; that though Spanish is widely known, it is inadvisable to make it the language of the country; and, lastly, that the aim in view is to weld together and fuse as much as possible all these differing tribes and peoples, it was determined that English should be the language of the country, and that all teaching should be carried on in it. The present organization comprises, in addition to the superintendents, some 750 American and 2500 native teachers, who look after about a quarter of a million children in more than 2000 schools. There are also provincial secondary schools with industrial departments, agricultural schools, and a nautical school which trains for the mercantile marine.

If, as seems to be the case, the American "man in the street" is only now beginning to realize that the new possessions of the United States in the East are not a coherent whole, and seeks to know something more of the present condition of things, he will find a tolerably clear, if not very exhaustive account of the archipelago in Mr. Atkinson's book, aided by many useful illustrations which are evidently specially taken or chosen with the idea of elucidating the text. It is, however, in the last two or three chapters only that the careful student of the Philippines and the Filipinos is likely to find much that is new. Events march quickly nowadays, and it is hard to realize the changes that have already taken place since the American annexation. But this volume foreshadows even greater. Not before we read it did we grasp the fact that before many years are over some seven or eight million more people will have been added to the English-speaking races. Mr. Atkinson goes a point further and says, "we have scratched the Malay, and at some future date need not be surprised to find an American, at least in spirit and initiative;" but this is a phase of development which for the present we may take leave to doubt.

F. H. H. G.

Eastern Asia.

'My Travels in China, Japan, and Java, 1903.' By H. H. Raja-i-Rajgan Jagatjit Sing, of Kapurthala. London: Hutchinson & Co. 1905.

An interesting and well-written account of an Indian prince's tour in Eastern Asia, the incidents of which are described in thoroughly good English. In China, the prince was more than disappointed with what he saw of the Chinese. He wonders at the tenacity with which they cling to their ancient habits and customs, and considers them selfish, indolent, and backward. The number of foreign troops of all nationalities stationed in China caused the prince some astonishment, and while remarking on the various barracks he visited, he considers that the Italians have paid a high compliment to their compatriot in installing a complete system of wireless telegraphy in their barracks. The majesty of the ancient city of Pekin claimed a large share of the prince's attention, and, even before the outbreak of the recent war, he was much impressed with the strategic value of the trans-Siberian railway.

As a contrast to the "indolent" Chinese, the prince describes the Japanese, whose general progress and activity pleased him greatly. One of the most notable features about the Japanese was their studied politeness to foreigners. During his stay in Japan, the author attended the empress's annual chrysanthemum party, the management of which he places on a level with that of a levée at Buckingham

Palace. The Japanese soldier comes in for praise on account of his smartness and effectiveness, though the horses of the cavalry are condemned as being undersized. The tour was brought to a close by a visit to the Dutch East Indies, where the prince was astonished to find Europeans wearing the native clothing. He characterizes Batavia as essentially Dutch, and compares the freedom of native princes under British rule in India with the petty tyranny to which the princes in Netherlands India are subjected. Throughout the book the author proves himself to be a man of clear perception, and possessed of much literary skill.

Manchuria.

'Puteshestviye po Manchurii.' E. E. Anert. St. Petersburg: Press of the Academy of Sciences. 1904.

In this volume, a memoir of the Russian Geographical Society, M. Anert describes journeys he made in Manchuria during the years 1896–98, chiefly to investigate the geology of the country. Entering Manchuria from the north-east, and making many excursions in various directions from Kirin, he and his companions, MM. Volkof, Moreyef, and Revakin, traversed a great part of the country and collected a large amount of information, though, as he admits, there is still much to be learned of the geology. The chief orographical features beginning from the Mongolo-Manchurian plain on the west, 650 feet above sea-level, are the second range west of Kirin, rising to 1950 feet; the basin of Bulahai and San-ho-tung, to the south-west of which lies the first range west of Kirin, and the basin of the Mai-ho; then the Manchurian highlands, rising to 3300 feet with Paik-tu-shan (White Mountain, 8000 feet); the Korean range (1600–2200 feet); and the slope to the sea of Japan. The configuration is largely due to faulting. Gneiss, archæan schists, and other crystalline rocks predominate, and outflows of volcanic rocks are especially extensive round Paik-tu-shan. The volume is accompanied by a general map showing the places of occurrence of useful minerals, and a geological map of the parts investigated.

AFRICA.

West Africa.

'The Rise of British West Africa.' By Claude George. Houlston & Sons. 1903.

This volume deals with the early history of Sierra Leone, the Gambia, Lagos, the Gold Coast, etc. In the course of his narrative, the author describes the many trials and failures encountered in the attempt to establish a free settlement for negroes and people of colour on the Grain Coast of Africa. The history of Sierra Leone dates from the year 1787, and in 1790 the Sierra Leone Company was formed to manage and govern the colony. The company purposed establishing trade between Great Britain and the ports of the West Coast of Africa, but its financial losses, combined with the aggressive attitude of the native chiefs, and the growing importance and responsibilities of the colony proved insuperable, and in 1807, when it petitioned for dissolution, its demand was granted. The company's work was carried on by the African Institution, under whose *régime* the colony made rapid progress, in spite of difficulties with native tribes. The author goes on to describe the indecisive campaign in Ashanti, which ended in the death of Sir Charles Macarthy, the governor of Sierra Leone, at Ensikuma. For two years British prestige suffered, until Lieut.-Colonel Pordon, acting without orders, dealt the Ashantis a decisive blow. About this time the Sherbro expedition was undertaken, which proved more successful than the previous one.

Sir Neil Campbell succeeded Sir Charles Turner (who had succumbed to fever

contracted while on the Sherbro expedition) as governor. The author takes it on himself to criticize the ever-present policy of economy instituted by Sir Neil Campbell as being detrimental to the country's good. In 1827 the British Government decided on the evacuation of the Gold Coast settlements, owing to the unsatisfactory reports of the governors. The author devotes some space to the history of the Bananas and Banu islands, besides giving lengthy particulars relative to the commercial and social affairs of the colonies. To those who wish to study the early history of the West Coast of Africa under British rule, this book will be valuable for the large amount of information, not always readily accessible, which it contains.

The Sudan.

'The Anglo-Egyptian Sudan: a Compendium prepared by Officers of the Sudan Government.' Edited by Lieut.-Colonel Count Gleichen, C.V.O., C.M.G., D.S.O. In two volumes. *With* 82 *Illustrations and* 2 *Maps.* London: Printed for H.M.'s Stationery Office by Harrison & Sons, St. Martin's Lane. 1905. *Price* 10*s.*

A compendium derived from official sources, giving a comprehensive survey of the reconquered territories in the Sudan, and the latest information in regard to their administration and resources, is obviously a work that should appeal to a large body of readers, and be of special value to the officers serving under the Sudan Government. Hitherto this information has been accessible only in the 'Handbook to the Sudan,' and its Supplement, published in 1898 and 1899, respectively, and in numerous official publications issued by the Sudan and Egyptian Governments. The present compendium is based on these, and brought up to 1905; but the information it contains is not quite conveniently arranged for the purpose of reference. To have presented a well-digested and well-balanced account of these vast and imperfectly surveyed territories was, no doubt, a task beyond the powers of a hard-worked official; otherwise there might have been a more systematic arrangement of the material, and a handier form of publication. These bulky tomes, measuring 10 by 12 inches, and weighing 9 lbs., are evidently not meant for service in the field, and are difficult enough to handle in a library.

On the other hand, nothing but praise can be given to the subject-matter. It is a veritable mine of reliable data for those who have the leisure to quarry in it; and the value of the more recent information, which can be found nowhere else, will be highly appreciated by all interested in the Anglo-Egyptian Sudan.

Part i. of vol. 1 is geographical and descriptive, the first chapter being specially useful; and part ii. is historical. The White Nile with its *régime* is surveyed, in the light of Sir William Garstin's admirable work, in the second chapter. Other chapters deal with various regions of the Anglo-Egyptian Sudan under a classification that is neither strictly geographical, ethnographical, nor administrative, and therefore somewhat confusing to the reader. It would have been better to avoid subdividing the Anglo-Egyptian territories in the Sudan into *quasi*-geographical areas by using the names of provinces or mudirias. "Central Eastern Sudan," if legitimate at all, should be "East Central Sudan;" and, of course, there are the usual inconsistencies in the spelling of place-names—the most flagrant being Khartoum, which we regret to see has been officially adopted, in spite of the Anglicized Sudan and the phonetic rendering of Aswan. We prefer Eritrea to Erythræa, and still more to use one or the other uniformly, and Senussi or Senussia to Senussiites.

Useful appendices to vol. 1 are published on the sudd; the zoology, antiquities, and ethnology of the Nile Valley; a list of tribes and sheikhs; and the boundaries

of provinces. The text of treaties and agreements regarding the Anglo-Egyptian Sudan, or indirectly affecting these territories, are also given, and a map on the scale of 1 : 4,000,000, compiled in the Intelligence Office at Khartum, is appended.

"For the convenience of practical reference," the itineraries and route surveys —or most of them—are bound up in vol. 2, to which there is no index.

The editors are Lieut.-Colonel Count Gleichen, formerly the Director of Intelligence to the Sudan Government and the Egyptian army, and Captain A. H. Morant, Assistant Director; and the contributors include the names of the leading officers of the Sudan Government, past and present: so that this joint production is highly creditable to the Anglo-Egyptian Condominium.

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea.

'Two Years among New Guinea Cannibals. A Naturalist's Sojourn among the Aborigines of Unexplored New Guinea.' By A. E. Pratt, with Notes and Observations by his son, Henry Pratt. 360 pp. 54 *Illustrations and a Map.* London: Seeley & Co. 1906.

Mr. Pratt has travelled a great deal, and is known as a careful and successful collector. In his new book he shows himself to be an enthusiastic and intrepid naturalist, who describes in an interesting manner the natives he met, and the experiences he underwent in his recent expedition to British New Guinea. Although a map is given which claims to give a more correct course of the Angabunga, or St. Joseph river, we fear that neither it nor the book itself adds materially to our geographical knowledge. The book is also disappointing from an ethnological point of view; but this is not to be wondered at, as the author had no special knowledge of ethnology generally, or of the particular problems to be attacked in New Guinea, consequently we do not recommend any one consulting this book, unless he already has an adequate knowledge of the subject. There are a few good descriptions of the habits of bower birds and birds of paradise, and other natural history notes. A long list is given of new Lepidoptera discovered during the expedition, and a description of "a new reptile," which we presume is a snake, and of a new fish. There is a large number of excellent photographic plates, and several drawings, some of which are good, while others are, to say the least of it, misleading. We must hold the publishers responsible for numerous typographical errors, such as the misspelling of names of persons, animals, and places, as the author was conducting another expedition in New Guinea whilst the book was being published. A. C. H.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Lakes.

'Die physikalischen Eigenschaften der Seen.' By Dr. Otto Freiherr von und zu Aufsess. Pp. x. + 120. Brunswick: Vieweg und Sohn. 1905. *Price* 3 *marks.*

This is a book dealing with the physical part of that very new science which is called "Limnology." Many papers and books have been already written on one or several biological or physical properties of the lakes; the object of the present book is to collect the principal facts known, and to give a general view of the results arrived at.

In the Introduction the author tells us that the development of limnology is

due to Prof. Forel's work, viz. to his well-known books 'Le Léman' and 'Handbuch der Seenkunde'; he gives Forel's definition of a lake as being "eine allseitig geschlossene, in einer Vertiefung des Bodens befindliche, mit dem Meere nicht in direkter Verbindung stehende, ruhende Wassermasse."

Some preliminary remarks deal with general considerations, curvature of the lake's surface, pressure, density, and compressibility of water.

The chapter on mechanics deals with the study of different movements observed in lakes, viz. progressive or ordinary waves and standing waves or "seiches," and currents. "Seiches" were first studied carefully by Prof. Forel in the Lake of Geneva. The instrument employed for the measurement of these standing waves has been constructed from Ed. Sarasin's designs and calculations. It is called "limnomètre enregistreur transportable." These seiches vary in amplitude from some millimetres up to 1·87 m. (highest seiche in the Lake of Geneva), and much more in the great lakes of North America. This peculiar kind of wave, which affects the whole body of the lake, is probably due to sudden variations of atmospheric pressure, changes in the direction and the strength of the wind. The author gives, also, a short *résumé* of the mathematical theories of the seiches, theories which were more deeply and carefully studied last year by Prof. Chrystal, of Edinburgh University, and Mr. Maclagan Wedderburn, of the Scottish Lake Survey, while making improvements on Sarasin's limnograph.

The acoustic properties of lakes are dealt with in a short chapter.

The optical properties of lakes, such as colour, transparency, reflection, and refraction, are dealt with in a very intelligible and attractive manner, for these questions are often difficult and intricate.

The last chapter deals with the thermal properties of lakes, such as distribution of temperature, formation of ice, and storage of summer's heat by the water.

A list of the most recent and important papers on physical limnology concludes the book, but I have been struck by the fact that the author does not mention any of the papers published by the Scottish Lake Survey. However, this book is a useful guide and a good *résumé* of the subject.

Should a revised edition be called for, it will be necessary to take cognisance of a large number of important papers on the same subject which have appeared since this book was published.

LÉON W. COLLET.

HISTORICAL GEOGRAPHY.

ROMAN GEOGRAPHY.

'Quellen und Forschungen zur alten Geschichte und Geographie, herausgegeben von W. Sieglin, Professor der historischen Geographie an der Universität Berlin.' Parts 2, 3, 4, 9, containing (*a*) *Austria Romana*, parts i., ii., iii., 'Geographisches Lexikon aller zu Römerzeiten in Östreich genannten Berge, Flüsse, Häfen, Länder, Städte, Völker,' etc., von Fritz Pichler, 1902–3; and (*b*) 'Die geographischen Bücher (ii. 242–vi.) der *Naturalis Historia* des C. Plinius Secundus . . . herausgegeben von D. Detlefsen, Berlin, 1904.'

Here we have an admirable critical edition of the geographical sections of Pliny's 'Natural History,' as well as a most useful gazetteer for the Austrian lands under Roman occupation. It is difficult to speak too highly of the value of this series, which no student of ancient history and geography can dispense with, and which has been so ably conducted to the filling up of important and regrettable gaps in knowledge. We have only to compare, for instance, Dr. Detlefsen's text and critical apparatus with that of Sillig, in the same portions of Pliny, to see how well the former has done his work. The 'Historia Naturalis' has had few rivals in

the extent and continuity of its power, and especially of its power for evil, over the human mind; throughout the Dark Age section of the Mediæval Period, from the fifth to the eleventh century, above all by means of the Solinian abridgment, it dominated not only geography, but natural history, botany, mineralogy, and most branches of natural science; and as it was resorted to for its marvels rather than its fact, for its dross rather than its gold, its influence was, in the highest degree, anti-scientific. C. R. B.

THE MONTHLY RECORD.

THE SOCIETY.

The Awards for 1906.—The Founder's Medal of the Society has this year been awarded to M. Alfred Grandidier, the veteran French savant, who for the last forty years has devoted himself to the exploration of the great island of Madagascar, and to the publication of its results in a monumental work to be completed in about fifty-two large quarto volumes. M. Grandidier's life-work, it is needless to say, has been of the highest value to scientific geography, and forms the basis of our existing knowledge of Madagascar. The Patron's Medal goes to Dr. Robert Bell, of the Geological Survey of Canada, who during forty-five years of field work has mapped an immense area of Canada previously unknown. His memoirs and papers, published in the Reports of the Survey and elsewhere, number some two hundred, and he is especially known to geographers for the part which he took in various expeditions sent by the Canadian Government to Hudson strait and bay, and for his exploration of the rivers entering that bay from the south, an account of which was given by him before the Society in 1897. The Victoria Research Medal is awarded to Prof. W. M. Ramsay, who has been working at ancient geography for nearly thirty years, and has, by his researches in Asia Minor, revolutionized the methods on which the study of the subject is based, and thrown a flood of light on many historical questions which could only be understood through an accurate knowledge of the topography of the lands to which they relate. His topographical labours have also done much to supply material for the improvement of the modern map of Asia Minor. The other awards are made as follows: The Murchison Grant goes to Major H. R. Davies, for his extensive surveys in the Kachin hills, Shan States, and Western China, where his exploration of trade and railway routes in Yunnan and Sechuan has supplied a large proportion of the material available for the latest maps of those provinces. The Gill Memorial is bestowed on Major A. St. Hill Gibbons, for the important exploring and survey work carried out during his two expeditions to Barotseland in 1895–96 and in 1898–1900, to which (with that performed by his associates) we are largely indebted for our existing knowledge of Northern Rhodesia. The Cuthbert Peek Grant to Major H. H. Austin, for his valuable

geographical work in East Africa, especially in the region of Lake Rudolf and the Sobat river. Lastly, the Back Grant is given to Major R. S. T. Bright, for his surveys in the Sudan, Uganda, and East Africa under the successive leadership of Major Austin, Colonel Delmé-Radcliffe, and Colonel G. E. Smith.

EUROPE.

Raised Beaches in Scotland.—Writers on the recent geological history of Scotland have very generally assumed considerable changes of level indicated by raised beaches at heights of 50 and 100 feet respectively. The reality of these supposed beaches is questioned in the *Geological Magazine* for January last by Mr. T. F. Jamieson, who, however, confines his observations to the east side of Scotland, where, as he allows, the facts may differ somewhat from those on the west. So long ago as 1874, Mr. Jamieson maintained that, subsequent to the last great glaciation, no submergence of the country had taken place beyond that slight change of level which is marked by the estuary beds and raised beaches a little above the present coast-line. In general, this change does not seem to have exceeded 30 feet at most, though the old estuary mud or carse land may rise to a height of 40 or 50 feet at its inland extremity, through the corresponding rise in the height of the tidal wave in moving up a valley. Mr. Jamieson puts forward the following reasons for doubting the existence of the 50 and 100 feet beaches on the east side of Scotland: (1) The occurrence, at and below these levels, of moraine heaps which show no evidence of sea-action on them up to such heights. (2) The absence of estuary mud with its characteristic fossils at levels where the supposed submergence would have produced it. (3) Absence of beds of littoral shells at levels corresponding to such beaches. (4) The presence, in the beds of clay associated by geologists with the 100-feet beach, of remains which indicate deeper water and an older stage of the glacial period. (5) Evidence that these clays have been wasted and disturbed by subsequent glacial action, being therefore anterior to the last general glaciation.

The Ice Age in Pembrokeshire.—The opinions of geologists have differed widely as to the extent to which South Wales was touched by the ice-sheets moving south over the west of Great Britain in the Ice Age. Thus, while Prof. James Geikie brings down the southern edge of the great ice-sheet as far as the Bristol channel, Mr. Carvill Lewis placed the limit at a line running eastward from the St. David's promontory, the glaciation of northern Pembrokeshire being attributed by him to local ice. In spite of the detailed research bestowed on some of the older formations of Pembrokeshire, the more recent, especially the glacial, deposits were for long more or less neglected, and it is only quite lately that they have been examined by Dr. T. J. Jehu in such a way as to permit their sequence to be duly established, and to supply a basis for comparing the glacial phenomena in South Wales with those further north. Dr. Jehu, who has recorded the results of his researches in the *Transactions of the Royal Society of Edinburgh* (vol. 41, part i., 1905), distinguishes three series of deposits in descending order, viz. the upper boulder-clay and rubbly drift; a series of sands and gravels; and the lower boulder-clay. It is a curious fact that the last named, which has received no attention within recent times, was described in Shakespeare's time by George Owen, of Henllys (in his 'Description of Pembrokeshire'), under the designation "Claye-Marle," and in a manner which Dr. Jehu pronounces generally accurate. We cannot follow the latter writer in his detailed description of the deposits, or of his discussion of the evidence supplied by erratics, but the following general conclusions may be noted. The lower boulder-clay, which has the widest extension

of the three series, is undoubtedly the product of an ice-sheet, and has all the characteristics of a true ground moraine. The included stones are often intensely glaciated, while fragments of marine shells prove that the ice which gave rise to the clay must have travelled over a sea-bottom. Boulders from the south-west of Scotland and the north-east of Ireland occur as far east as Cardigan, proving that the ice-sheet which filled the northern basin of the Irish sea had a southward extension, which invaded northern Pembrokeshire along its whole extent, and even encroached on Cardiganshire to the east. The sands and gravels of northern Pembrokeshire are scattered in patches over a wide area, and are the products of the washing and re-sorting of the intra-glacial detritus, chiefly at the melting of the ice-sheet. The upper boulder-clay is very sporadic in its occurrence, but may possibly represent a second advance of the ice-sheet after an interval of less severe conditions.

ASIA.

Moorcroft and Hearsey in Tibet.—A correspondent makes the following remarks on this subject: "In Colonel Hugh Pearse's interesting paper in the *Geographical Journal* for August last on Moorcroft and Hearsey's visit to Lake Mansarowar in 1812, one noteworthy geographical point has not been referred to, viz. the kindness shown to the travellers on that occasion by Deb Singh and Ber Singh, father and uncle of Kishen Singh and Nain Singh, the famous Indian explorers. The family of the Singhs (Kishen Singh, or A-K, is, we believe, still alive) has been established for many generations in Milam, in Kumaun, where they have been and are still held in high esteem, and from whence they derive their designation of "Milm-wal." During the arrest and detention of Moorcroft and Hearsey some 80 miles north-west of Lake Mansarowar, Deb Singh and Ber Singh hastened to proffer their good offices—a kindness which the two travellers acknowledged in the following testimonial:—

"'This certifies that Deb Singh and Ber Singh, sons of Dhamoo, an inhabitant and man of consequence in the town of Melim, in the country of Jooar, have shown to us great attention and civility. Under an idea that we were in want of funds, they offered us a *hoondee* (*i.e.* bill of exchange) on Sreenuggur for 1000 rupees, to be paid at whatever period might suit our convenience, and either in money or goods as might be most agreeable to us. Although the state of our finances rendered the loan unnecessary, we have much pleasure in recording the circumstance, and in giving this testimonial of the good-will they bore towards us.

W. Moorcroft.
H. J. Hearsey.

"'Northern foot of the Himachal mountains,
"'near Daba, in Chinese Tartary, August 25, 1812.'

"A second testimonial signed by Moorcroft alone, bearing the same date, recommends that the Honourable Company's officers will afford all due facilities to Deb Singh and Ber Singh in enabling them to dispose of their merchandise on the British side of the frontier. It appears from Mr. C. E. D. Black's 'Memoir on the Indian Surveys,' 1875–1890 (p. 151), that the release of Moorcroft and Hearsey was eventually effected by the interposition and on the security of Deb Singh and Ber Singh, but the certificate from Moorcroft giving the particulars of the incident has unfortunately been lost. The other certificates are still in the possession of Kishen Singh. Another very interesting point on which further light is desired is whether Moorcroft ever dwelt in Lhasa. It may be remembered that the Abbé Huc, who reached the Tibetan capital a few years after, asserted positively that he had been credibly informed that Moorcroft resided there for some years. As the interval between the two travellers was not long, it would hardly seem likely that the abbé

was misinformed, and the mystery attaching to Moorcroft's latter years and eventual death makes further research very desirable."

The Philippine Islands.—A British Consular Report (No. 3512, Annual Series) on the trade of the Philippine islands for 1904 gives the total population, as published February, 1905, at 7,635,426, of whom 6,987,686 are classed as civilized, and 647,740 as wild. Of the civilized, 6,931,548 were natives, 8135 migrated from the United States, and 41,035 from China. Two breakwaters are in course of construction at Manila; one extending west to the harbour and following the shore-line of the bay for 8635 feet, the other extending 2785 feet in a north-westerly direction. The harbour, 400 acres in area, is to be of a uniform depth of at least 30 feet, while wharves and piers are being built to accommodate vessels of the largest tonnage; 150 acres have also been reclaimed from the foreshore. Projected harbour improvements at Iloilo include the dredging of a channel 7500 feet long by 300 to 400 feet wide, and the construction of two breakwaters at the river's mouth. For Cebu harbour a concrete masonry dock and bulkhead, 2500 feet long, is to be constructed, and 13 acres of land reclaimed. Eighty miles of new railway line have been constructed or are in course of construction, and there is a comprehensive scheme for the construction of lines in the different islands. The total trade of the islands for 1904 shows a decrease by an eighth on that of 1903, but a slight increase on the average annual trade for the past five years.

AFRICA.

Austrian Expedition to Southern Abyssinia.—Last year a successful expedition to Kaffa and other of the less-visited provinces of Southern Abyssinia was made by Baron von Mylius and Herr Friedrich Bieber, members of the Austrian mission which visited the court of Menelik earlier in the same year. A short account of the expedition has appeared in the *Deutsche Rundschau für Geographie* for January, 1906. The outward route led south-west from Addis Ababa across the Hawash through Soddo and other districts to Limmu and Enarea, and thus seems to have coincided in the main with that of Cecchi and Chiarini on their journey to Kaffa in 1878–79. The state of Jimma-kaka, which was afterwards traversed, has still retained a quasi-independence of Abyssinia, partly owing to its Mohammedan population. Its capital, Jiren (also visited from the south-west by Oscar Neumann), like other markets of the country, is a great centre of trade for the whole of this part of Africa, and the people are decidedly superior to the Amharans in material culture. Crossing the Gojeb, the expedition reached Anderacha, the old capital of Kaffa, which has now been supplanted by the new town of Sharada, the residence of the governor Ras Wolde Giorgis, which is situated on the Shushi mountains (Susa of Cecchi). Previous visitors to Kaffa had traversed only the northern parts of the state,* but the Austrian travellers were able to penetrate further, and their account of the country supplements those of their predecessors. Crossing the Guma river, they visited Buna, the site of a former royal residence and burial-place, and pushed on with great difficulty through almost impenetrable forest with soft alluvial soil to Shadda, the coronation-place of the ruler of Kaffa. This was the most southerly point reached; the route then apparently turning east across a range reaching 9600 feet to Sharada, whither a part of the expedition had already been sent. Kaffa is described as a forest-land of romantic beauty, and its mild and moist climate renders it exceptionally fertile. Wild coffee constituted the greater part of the

* The Russian Bulatovich (*Journal*, vol. 14, p. 664) seems to have covered more ground, but no full account of his journey has been published.

underwood in places, and rubber trees were very plentiful, but were chiefly used for fuel or building. The Kafficho retain some slight traces of the Christianity said to have been long ago established in the country, but their religion is in the main a nature-worship. They are reserved in disposition, but are industrious and moral. The return route led eastward through Konta and Kullo or Dauro, the latter an alpine land of much charm. It is well cultivated, and is held to be the chief source of the wealth of Abyssinia. The people show many signs of Kafficho influence, though physically more akin to the Negroes. The journey was undertaken in part in the interest of the Austrian trade, for which the countries traversed are held to offer good prospects.

M. Gautier's Journey across the Sahara.—The brief accounts of this journey already given in the *Journal* (vol. 26, p. 670; vol. 27, p. 88) were from preliminary communications only, and the importance and interest of the achievement call for some further notice, a more detailed account having been given by the traveller before the Paris Geographical Society (*La Géographie*, 1906, No. 1). M. Gautier explained that the journey as carried out was the result of more or less hurriedly improvised arrangements, his inclinations having long turned his view rather to the western *terra incognita* (lately traversed in part by M. Flye Sainte-Marie: cf. *Journal*, vol. 26, p. 671) than to the southern route to Timbuktu. This helps to emphasize the change in the political conditions of the Central Sahara observable within the last few years, which has robbed travel in that region of most of its dangers and difficulties. The fact that the journey was made in the height of summer made the passage of the waterless Tanezruft a more serious undertaking than it would otherwise have been, and involved two several halts of a fortnight in order to rest the camels. But six weeks' actual travelling sufficed for the journey from Tuat to the Niger, and M. Gautier considers that under favourable conditions it might be completed within that time. In the earlier part of the journey the traveller made several lengthened *détours* from the direct route, thus covering much new ground even here; but the greatest interest centres in the more southern section. M. Gautier has a good deal to say about the Tuareg and their relations to the French authorities. Although not yet enthusiastic adherents of their new masters, there are signs that a more cordial feeling is springing up among them, and there exists what M. Gautier terms a "parti jeune-hoggar," which is inclined to favour a further *rapprochement*. It was to the most influential member of this party, Musa ag Amastane, that the traveller owed his safe passage, with one servant only for part of the way, across the territory of the Ifora Tuareg, to some extent vassals of the Hoggar (this includes the mountainous tract generally known by the generic term Adrar). The journey across this tract is described as charming, the wide valleys being filled with fine trees and swarming with game, while, it being the rainy season, the country was covered with verdure, and the traveller could have imagined himself in Normandy. At this season the people leave the wells and spread over the country, which becomes dotted over with their leather tents. In spite of the ridiculously small size of these, they exercise all the attraction of "home," and it is to this fact that M. Gautier ascribes the complete pacification of the country, the tents and all that they imply in the way of home-life being at the mercy of the recently formed camel corps. The results of the journey include surveys of all the new portions of the route, many geological observations (which have, M. Gautier thinks, established the existence, especially in the Muidir Ahnet, of important earth-movements contemporaneous with the elevation of the Atlas), and a collection of ethnographic objects. It would appear that this part of the Sahara was the scene of a Neolithic civilization derived from the Sudan,

which afterwards gave place to the Berber invaders. In Quaternary times there seems to have been a hydrographic system embracing all the existing weds of the Central Sahara, together with the upper Niger itself (since diverted southwards), the whole converging on the depression of Taodeni. It is suggested that this area may as late as Roman times have been the site of an agricultural civilization, Sudanese in origin. Even now it does not really form part of the desert, for the dunes along the Niger are not modern, but seem to date from a period when the desert occupied a more southerly zone than at present. M. Gautier ascribes the small agricultural development on the Niger at the present day to the fact that the country is occupied by a race of herdmen. He considers it to form an indivisible whole with the region of the northern oases, and deprecates the drawing of an administrative line of division across the very centre of the Tuareg domain.

M. Chudeau's Geological Researches in the Sahara.—It will be remembered that M. Gautier was accompanied, during the first part of his journey, by a geologist, M. Chudeau, who subsequently proceeded east and south to Zinder, thus adding one more to the recent passages of the desert. In parts the route was entirely new, though south of In Azaua it coincided in the main with that of Foureau. The journey has added to our knowledge of Saharan geology, and a preliminary sketch of the results from this point of view is contained in the January number of *La Géographie* and in the *Comptes Rendus* of the Paris Academy of Sciences for January 22 and February 26 (vol. 142, pp. 241 and 530). From the Tassili Tan Adagh (not Adrar, as it has sometimes been written), M. Chudeau went slightly north of east to Tit and Tamanghasset, near the borders of the Hoggar plateau, then striking south for Air. The Tassili Tan Adagh (in which is situated the famous well of Timissao) is a plateau of probable Devonian age bounded on three sides by faults which have brought the permeable Devonian strata into juxtaposition with the impermeable Silurian, thus explaining the abundant water-supply at Timissao. Silurian and Archæan formations occupied much of the area traversed, in association with recent volcanic outpourings. Around Tit, the alluvium is so deep that cultivation does not suffer severely from three successive years of drought. Both the southern part of the Hoggar plateau and the northern part of Air, as well as an intermediate tract, are described as Silurian and Archæan peneplains, above which (in the case of Air) the recent eruptive elevations rise. Cretaceous strata commence a few miles north of Agadez. M. Chudeau was struck by the character of indecision and incompleteness displayed by the hydrographic system of the country, presenting an analogy with that of Finland or Canada, though in these cases erosion began to act too late to bring about a normal state of things, while in the Sahara it ceased too soon.

AMERICA.

Central Newfoundland.—Owing to a misunderstanding, the sketch-map of the Gander river and neighbouring region, given in our last issue (p. 383), was attributed solely to Mr. J. G. Millais. It was, however, the joint work of that gentleman and Mr. J. McGaw, whose name should therefore have been added.

Dr. Koch's Travels in the Northern Amazon Basin.—An account of the journeys referred to last year in the *Journal* (vol. 26, p. 89) was given by Dr. Koch before the Berlin Geographical Society at the close of 1905, and has since appeared in the *Zeitschrift* of that body (1906, No. 2). Dr. Koch's researches were primarily devoted to ethnological subjects, but the region has remained sufficiently little known geographically to lend considerable interest to his narrative from this point of view also, while the map which accompanies the paper permits his routes to be followed with ease. Ascending the Rio Negro,

he made his headquarters at São Felippe, just below the junction of the Isanna with the main stream, a well-ordered settlement in which a good deal of real civilization has been introduced by Don Germano Garrido y Otero, a native of the north of Spain. A first journey led up the Isanna, and its tributary the Aiari, which was ascended to a point where it approaches so close to the Uaupes as to permit the journey from one stream to the other to be made in three and a half hours, across a quite low water-parting. This near approach of one river-system to another seems to be a characteristic of the region, for other instances were subsequently brought to light, the most remarkable being the separation of the Tikie, a western tributary of the Uaupes, from the system of the Yapura by a low water-parting that could be crossed in as short a time as fifty minutes. On the second journey, Dr. Koch descended the Rio Negro to the mouth of the Curicuriari, whence he ascended the mountain of the same name, with which many legends are associated by the natives. The path led through magnificent virgin forest, and involved much toilsome work, but the view from the summit over the boundless forests was full compensation for this. The few resident Indians of this region are emigrants from the Uaupes—mostly Tukanos—who have here found a refuge from the advance of so-called civilization. There are also wandering Indians—the Maku—on a much lower level of culture. Dr. Koch ascended the Curicuriari for a considerable distance, afterwards making a portage across a low divide to another tributary of the Uaupes, and ascending the Tikie, already referred to, almost to its source. The Tikie, like most of the rivers of this region, is broken by falls, among them the Pari fall, reached by Count Stradelli in 1881. Dr. Koch collected much ethnological material among the tribes visited, some of whom had never seen a white man. He alludes to the remarkable way in which the black- and white-water streams alternate without apparent reason, the two kinds occurring sometimes only a few hundred yards apart, though flowing through the same forest and over the same soil. Like other travellers, he found a reputation for fever ascribed to the white-water streams, while those with black water are immune.* The third journey was in some ways the most important, as it led up the main stream of the Uaupes or Caiari (Uacaiari of Wallace), past the turning-point of that traveller at the mouth of the Cuduiari (Codiari), and the Jurupari fall reached by Stradelli, to a station of Colombian rubber collectors on its upper course. The many falls involved great labour, but after the Jurupari the river presented a quite different character, flowing sluggishly through periodically water-logged lands, entirely uninhabited. Above his furthest point it is said to be formed by two branches, one from the west, the other from the open savannahs near the sources of the Guaviare in the north. On the return voyage Dr. Koch ascended the Cuduiari to the more open country near its source (though this is rather thin scrub than true savannah), and visited some extensive underground chambers and passages carved by natural agencies out of the sandstone. When finally leaving the country on his return to Europe, he explored the route from the Tikie to the Yapura system before alluded to, descending the latter river to the Amazon. The navigation of the small streams leading to the Apaporis branch of the Yapura was a matter of difficulty, and the country here was still quite a virgin field, the tribes met with having not previously seen a white man. Dr. Koch concludes with a sketch of the ethnology of the region, and especially the dances, of which he made a special study.

* Wallace found that the black-water streams were free from mosquitoes, while Dr. Koch merely says that the traveller avoids these pests during the whole ascent of the Rio Negro, leaving it obscure whether they were met with on any of the smaller streams.

AUSTRALASIA AND PACIFIC ISLANDS.

The Development of British New Guinea.—With a view to suggesting measures likely to promote the economic development of British New Guinea, while at the same time safe-guarding the interests of the natives, Mr. Atlee Hunt, Secretary in the Department of External Affairs of the Commonwealth Government, was sent in July last on a tour of inspection through the possession, under instructions from the then Federal prime minister. Mr. Hunt has since presented his report, which has been printed at Melbourne as a Parliamentary paper (No. 43. —F. 10,674). It necessarily deals rather with political than geographical questions, but is valuable as presenting a clear view of the present position of the territory, and the direction in which its future prosperity may most probably be secured. Mr. Hunt shows much insight into the essential factors of the problem, and the report affords pleasing evidence of the determination of those in authority to place the interests of the natives in the forefront of any policy that may be determined on. Having shown the objections attaching to various measures that have been suggested, including the introduction of European families as settlers, Mr. Hunt says that the ends to be aimed at seem to be, to encourage the development of the country under European auspices with imported capital but native labour, while at the same time the influence of Government is gradually extended over the whole possession. In discussing existing relations between white men and natives, he considers that, generally speaking, they are good. The laws prohibiting the supply to the natives of intoxicating liquors, firearms, or opium, and regulating the employment of native labour, are very strictly observed, their importance being generally recognized by the white residents. The operations of the missions have tended largely to the establishment of internal peace, but it is probably too soon to pronounce on the actual amount of progress achieved. Probably the advent of civilization may cause a deterioration in the native type, not so much by the introduction of positive ills, as by removing the need of strenuous exertion through the pacification of the country. As regards white enterprise, mining is the present mainstay of the possession, and in Mr. Hunt's opinion ought to be encouraged, but it is to agriculture that the country must look for its future. The Papuan is pronounced to be a fairly capable plantation hand, and at present, at least, the importation of labour should not go beyond the provision of experienced men—preferably Malays or Filipinos—as gangers, to make up for the Papuan incapacity for direction. The report ends by urging the allocation by the Australian Government of a certain sum as capital for the development of the possession.

POLAR REGIONS.

Mr. Mikkelsen's Expedition.—We have received from Mr. Mikkelsen a detailed statement of his plans for the expedition to the Beaufort sea, to which frequent reference has already been made in the *Journal*, and on which he proposes to sail from Victoria about the middle of May. The vessel which he has acquired for that purpose has been renamed the *Duchess of Bedford*, in honour of a prominent supporter of the expedition. She is a sailing craft of 66 tons, with a length of 67½ feet, 18 feet 9 inches beam, and 7½ feet depth of hold, and is built of camphor wood, the outside planking being of heart quakewood, which again is sheathed with gumwood above and below the water-line, and with iron plating at the bows. The ship was built as a sealer, and is specially strengthened by bulkheads, etc., to withstand ice-pressure. As already mentioned,

Messrs. Leffingwell, Stefansson, and Ditlevsen will proceed down the Mackenzie, while Mr. Mikkelsen will take the ship through Bering strait, visiting the coast of Siberia for the purpose of collecting dogs and one or two ponies; then pushing his way along the north-west coast of Alaska, and, if possible, avoiding the pack-ice by keeping inside the shoals, which the slight draught of the ship (8 feet) should enable him to do. Beyond Point Barrow special attention will be paid, so far as time permits, to tidal observations, which are here of particular interest by reason of the sudden change of twelve hours in the tide constant which seems to take place between Harrison bay and Herschel island. It is hoped that the whole expedition of ten men will be united at the mouth of the Mackenzie by about August 20. Proceeding eastward past Cape Bathurst, it will cross over to Prince of Wales strait, and endeavour to establish a depôt of provisions abreast of Princess Royal island. Retracing its course, it will establish winter quarters on Minto inlet, where as much scientific work as possible will be carried on, while some of the men will procure fresh meat by hunting. In the spring of 1907, two men, lightly equipped and making use of the depôt already formed, will endeavour to cross to Melville island, and thence to Prince Patrick island, afterwards making a trip of some 60 miles over the ice, and, if possible, obtaining an idea of the configuration of the sea-bottom by means of soundings. Meanwhile the scientific workers will have been extending their knowledge by means of trips from the ship, which, as soon as the ice opens sufficiently, will cross over to Nelson's head, and endeavour to follow the coast of Banks island to Burnet bay, where she will unship the provisions and remain either until the autumn of 1907, or, if supplies permit, until the summer of 1908, being then sent home. In the spring of 1908, a party of three men, with the dogs and pony, will start west-north-west over the ice, with provisions for a hundred and forty days, keeping this course as nearly as possible, until soundings show that the edge of the continental shelf is passed, or land is found, or the position of 150° W., 76° 30′ N., is reached. If the first-named eventuality is realized, an endeavour will be made to reach the edge of the shelf on a southward course, and to determine its trend as far as possible, the party making for the nearest coast when provisions run short. If land should be met with, it will be examined as far as possible; but if neither this nor the edge of the shelf should be found, the explorers will push on as near as possible to the position mentioned, whence they will either endeavour to reach Wrangel island, or make for the nearest coast, as circumstances may decide. In case the ship remains a second winter, as much scientific work as possible will be carried on at Burnet bay, but in any case the observers left here will take the ship home independently of the other party. It will be seen that the programme is an extensive one, and it is hardly to be supposed that unforeseen circumstances will not to some extent prevent it from being carried out in full. But if a part only of the work is accomplished, the expedition will deserve a high place among Arctic enterprises.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Volcanic and Seismic Catastrophes.—It is, happily, not often that two such destructive visitations as the late eruption of Vesuvius and the earthquake at San Francisco occur within the space of a single month. It is too early yet to discuss the scientific bearings of the catastrophes, but the main facts may be here recorded. Vesuvius, which since the beginning of the year had shown occasional signs of activity, seems first to have given warning of a more dangerous outbreak on March 28, when a new fissure opened some hundred yards from the upper station of the Funicular railway, from which lava began to pour forth. Explosions in the crater became more and more violent, and on April 4 another lava-stream

began to issue in the direction of Pompeii. On the night of April 5–6 the volcano ejected great blocks of rock, and on the latter day the lava-streams increased in volume and began to pour over the vineyards belonging to the village of Bosco Trecase. On the 7th this village was reported as completely surrounded, the inhabitants fleeing in terror, while not long afterwards it was completely destroyed by the advancing stream. Meanwhile the cone on the Pompeii side collapsed, a new crater opening at the base in the Atrio del Cavallo. Throughout the 7th and the following night the activity of the central crater is described by Dr. Matteucci, director of the Vesuvius observatory, as terrific and ever increasing, incandescent rocks being thrown up by the thousand to the height of over 2400 feet. A state of terror reigned in the surrounding area, many towns and villages being abandoned, the people flocking for refuge to Naples, which, however, did not escape the effects of the rain of dust and hot ashes. Falling on the roof of the market, they accumulated to such an extent that the weight caused it to collapse, killing and injuring scores of persons who were in it at the time. Many other roofs collapsed in the surrounding area, and the loss of life and property reached distressing proportions, rendering the eruption the most destructive that has occurred for many years. From April 9 onwards, however, the manifestations of activity became gradually less. The reported destruction of the Vesuvius observatory happily proved unfounded, the observers showing great pluck in remaining at their posts throughout. The earthquake on the Pacific coast of the United States—which, though its effects were most disastrous at San Francisco, carried destruction over a considerable area—took place early in the morning of April 18, the havoc wrought being appalling in its extent and suddenness. Within a very few minutes the city of San Francisco was largely a mass of ruins, some of the finest buildings of this capital of the West falling a prey to the violence of the shocks. But the direct action of the earthquake caused but a small part of the total destruction. The damage to the gas and electric light apparatus caused fires to break forth on all sides, which, in the absence of a water-supply (the water-mains having also burst), raged without let or hindrance until whole quarters of the city were reduced to heaps of cinders, and over a quarter of a million persons were rendered homeless. Communication with the outside world was for a time entirely suspended, thus rendering more difficult the organization of relief, which was instantly set on foot. The loss of life is estimated at many hundreds, while the damage to property has been placed at the enormous sum of £60,000,000.

Temperatures of Air, Earth, and Water.—In the January number of the *Meteorologische Zeitschrift*, Dr. Woeikoff examines the relation existing between the temperature of the lower layers of the atmosphere and that of the earth or water immediately below them. In the case of the oceans (the air immediately over which is, on an average, about 0·5° C. (0·9° Fahr.) cooler than the water), special circumstances may bring about much more considerable differences, as, *e.g.*, when cold and warm currents approach each other, or when the sea adjoins a continent much cooler in winter. Leaving on one side glacier-streams, and those supplied by springs or lakes, the rivers of the plains are in Europe generally warmer in summer than the air immediately above them. Rivers flowing through deserts, like the Nile and Amu-darya, are cooler than the air, which becomes greatly heated, while the water is cooled by evaporation. On the other hand, the water of rivers which flow through tropical forests, like the Amazon and Congo, is frequently warmer than the air, as the evaporation from the water is slight, while the air in the shade of the trees keeps cool. In the case of the Marne, in the Parc St. Maur near Paris, we have a complete ten-year series of observations on the comparative temperature of the water and air, which shows that on the average of each month the surface of

the water is warmer throughout the year than the air, though on the same basis the difference virtually disappears in mid-winter, when the reversal of the relation (as shown in the occasional excess of the air-temperature over that of the water) is most frequently observed, such excess also reaching its maximum amount at the same period. In a former paper Dr. Woeikoff had already discussed the relation between the temperature of the ground and that of the air immediately above it, showing the large amount by which the ground-temperature may exceed that of the lowest stratum of the air, especially in low latitudes. The author considers the causes of this considerable difference as contrasted with the small difference observable in the case of the oceans, one of them being, in his opinion, the fact that when the lowest stratum is heated its temperature is moderated by convection currents, whereas when it is cooled no such influence is at work, the equilibrium being all the more stable on account of such cooling.

GENERAL.

Prof. Kirchhoff on the terms "Nation" and "Nationality."—A monograph of sixty-four pages, in elucidation of the terms "nation" and "nationality," by Prof. Kirchhoff, sets forth in impressive relief the part played by geography in the formation of states. In the first of its four chapters "nation" and "state" are shown to be not necessarily co-extensive, "nation" in this respect being definable as "community of culture, craving, if not possessing, political unity, on the part of a considerable body of people." Nations from many lands and ages are cited, in pages of rich and varied picturesqueness, to severally witness how there is no such thing as a nation of pure blood. An item or two out of the mass of evidence, interesting alike geographically and historically, may be quoted. Norway has along its coast a streak of dark hair and eyes; in Russiandom are fused Finnish and Tatar tribes; no less checkered are the French and the people of the Iberian peninsula; ancient Italy absorbed Keltic, Ligurian, and Greek admixtures; mediæval Italy, Lombard, Norman, and Arabic. As much mixed was ancient Greece, while modern Greece is a triad of descendents of old Greeks, Slavs, and Albanese. Germany has not only taken up Kelts on the west and Slavs on the east; few and far between in a given region may yet be found skulls of living persons strikingly resembling in shape skulls found in prehistoric burial-mounds of the same region—alien prehistoric blood incorporated in the German "race." To pass over the African witness, no one will contend that the nation of the United States, constituted of fragments of all nations, involves kinship in blood. Yet are these multitudinous rakings of all the Earth, emptied into the capacious American vat, in process of national unification. Down to the Treaty of Utrecht there was not the faintest hint of ethnic difference between the Netherlanders about the mouth of the Rhine and the Zuyder Zee and the inland Germans bordering them; yet Cleves in Germany and Nijmegen in Holland, barely 12 miles apart, now lie nationally a world-wide distance from each other. Nor is language any clue to ethnological descent. People talk of the "Latin race." The Spaniards and Rumanians each speak Romance; while the ancestors of the Spaniards spoke Iberian, those of the Rumanians, Thracian. The Danes conquering Normandy adopted Romance; then, crossing to England, they re-Germanized their tongue. Africans, too, change their tongues as readily as their clothes. Switzerland is parcelled out among four peoples, but its geographic frontiers are national, while its linguistic frontiers are no barriers to confederate brotherhood. Issuing from the hilly foreland of the Swiss Alps, through regions now Latin and now German, of fluctuating boundaries in the vast but of like human type, you all at once breathe at Basel, or beyond Geneva, a new air. The difference is one neither

of descent nor of language, but of state. The second chapter works out the proposition, how it is the sentiment of interrelationship, begotten under geographic and other influences, and preparedness to safeguard such interrelationship at any cost against any opposition, that fashions a people, be they mere fractions of other peoples, into one distinctive nation. This proposition is illustrated more particularly by the history of Switzerland, Belgium, and the Afrikander Bund. Moltke resolves nationality into "Allgemeingefühl," the feeling of "mutual relationship" or integrality, causing the members of a nation to constitute an indivisible whole, so that a nation officially is a nation organically only according to the strength of that sentiment. Prof. Kirchhoff shows how the configuration of the habitat occasionally plays a more important part in the formation of states than does ethnic kinship, and among illustrations of this fact is cited the partition of Norway and Sweden.

OBITUARY.

Canon H. B. Tristram, F.R.S.

This well-known traveller, whose writings have done much to popularize a knowledge of Palestine and other countries of the Nearer East, died at Durham on March 8, 1906, at the ripe age of eighty-three years. Canon Tristram had held a residentiary stall at Durham cathedral since 1873, and for many years no figure had been better known and more thoroughly identified than his with the city and its neighbourhood, where his genial and striking personality will be seriously missed. His scientific pursuits were undertaken rather as recreations than as the serious business of life, but none the less they gained for him wide celebrity, and as a practical field naturalist and ornithologist still more than as a contributor to geographical knowledge, his name had long been known far beyond the circle in which he commonly moved. It is with his travels that we are here, of course, principally concerned, but any notice of his life would be incomplete without a reference to the sturdy independence of thought and unflinching adherence to principle which characterized him throughout his public career.

Canon Tristram came of a vigorous Northumbrian stock, being son of the Rev. H. B. Tristram, Vicar of Eglingham, near Alnwick. He was educated at Durham Grammar School and at Lincoln College, Oxford, where he graduated in 1844 with classical honours. In the following year he took holy orders, and, after holding the curacy of Morchard Bishop for a short time, became acting naval and military chaplain in Bermuda in 1847, and rector of Castle Eden, co. Durham, in 1849. In 1856, being compelled by ill health to winter in a more southern climate, he went to Algeria, and there undertook the first of the many journeys which made him known to the public as a traveller. Quickly benefiting by the change of climate, he made many excursions into the interior, where full scope was given to his fondness for natural history and love of adventure, his wanderings leading him beyond the mountains to the northern borders of the Sahara. To this region, where French influence was then only beginning its forward advance, he devoted the whole of a second winter in the south, traversing districts hardly known to Europeans, and never before visited by an Englishman. In particular, he made the acquaintance of that interesting people the Beni Mzab, of whom he gave a striking account in the narrative of his journeys published in 1860. In this year he became Master of Greatham Hospital and Vicar of Greatham, which he continued to be until he removed to Durham in 1873. It was during this interval that he carried out his most extended journeys in Palestine and

neighbouring countries, their outcome being his well-known works entitled 'The Land of Israel,' in which he gave an interesting account of the physical aspects of the Bible lands, and 'The Land of Moab,' which described the discovery and identification of several important historical sites in the lands east of the Jordan. Besides several times revisiting the Turkish dominions in Asia, he in later years made acquaintance with the Canary islands and Japan, in which last a daughter has for some years been working under the Church Missionary Society, of which body he was always a zealous supporter.

Canon Tristram was a regular attendant at the meetings of the British Association, over the biological section of which he presided in 1893, whilst he likewise took a warm interest in the proceedings of the geographical section. He was present at the Cambridge meeting less than two years ago, and astonished his many friends by the keenness with which he still threw himself into its varied functions, scientific and social. Since his death it has been pointed out, as evidence of his quick grasp of scientific principles, that he was one of the first to recognize the force of Darwin's views on the origin of species, his study of the birds of North Africa having shown him the capability of the theory to explain existing relationships, even before its detailed presentation to the world. His collection of birds, a considerable portion of which was a few years ago acquired by the Liverpool Museum, was one of the most complete ever brought together by a private collector.

Canon Tristram married Eleanor Bowlby (daughter of an officer who served in the Peninsula and at Waterloo), on the third anniversary of whose death his own took place. He leaves behind a son (head master of Loretto School) and seven daughters, and had lived to see his descendants of the fourth generation.

Coutts Trotter.

The late Mr. Coutts Trotter was the eldest son of Mr. Archibald Trotter, of Dreghorn, Midlothian, and by his death the Royal Geographical Society has lost a Fellow of thirty years' standing, and the Royal Scottish Geographical Society one of its earliest and most zealous supporters. He was born in April, 1831, in Edinburgh, and was educated at Rugby and Haileybury, being destined for the service of the East India Company. Here he gave evidence of future distinction, and carried off the gold medal for political economy. But, unfortunately, he was constitutionally delicate, and was soon to find that his bad health was sufficient to debar him from any public career of usefulness. Although appointed to a post in Bengal, he got no further than Bombay, and had to return home invalided almost immediately. When sufficiently recovered he made another attempt to join his post, but with equal unsuccess; the climate was too much for him. Then he studied for a short time at Balliol College, Oxford, without any intention of entering a profession. In 1862 he married a daughter of the Right Hon. R. Keatinge, one of the judges of the High Court of Justice in Dublin, and some years afterwards settled in Bournemouth for the benefit of his health. Here he began reviewing for the *Athenæum*, which he continued to do for nearly thirty years, and for the *Academy* till it changed hands. He also contributed to the *Quarterly Review* and *Blackwood's Magazine*. In 1882 he settled in Edinburgh, and two years afterwards he helped to found the Geographical Society of Scotland for the purpose of diffusing and popularizing that important branch of knowledge in the northern kingdom. His interest in it never slackened, and he continued to attend committee meetings almost up to the end, when he was so enfeebled that he could not walk without assistance.

For the benefit of his health he was frequently ordered abroad. In 1886 he

visited Fiji, Tonga, Samoa, and Australia, thereby gaining a personal knowledge of that part of the world which made him a competent authority on geographical and other questions connected therewith. He had for some years previously taken a keen interest in such questions, and especially in the island of New Guinea, the extension of British influence over which found in him a warm advocate. At the invitation of his friend the Rev. Robertson Smith, then editor of the *Encyclopædia Britannica*, he contributed to its ninth edition the articles on Fiji and New Guinea. He also read a paper on New Guinea at the meeting of the British Association in 1883, and a more extended account of the existing knowledge of the great island was printed in the R.G.S. *Proceedings* in 1884. He had carefully studied the history of discovery in this region, and served for several years on the council of the Hakluyt Society.

In the course of his travels he visited Teneriffe, Algeria, the Cape, and Egypt, while in 1897 he went to Canada with the British Association, and the following year he was again in Egypt. Wherever he went he made many friends, for he was eminently sociable and sympathetic, and thoroughly enjoyed intellectual society. All who knew him will deplore his loss.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905–1906.

Eleventh Meeting, April 9, 1906.—The Right Hon. Sir George T. Goldie, K.C.M.G., D.C.L., F.R.S., President, in the Chair.

Elections:—*Captain Walter Mervyn St. George Kirke, R.A.; S. R. Timson*; *Horace Edward W. Young.*

Honorary Corresponding Members.

Professor Suess; Professor Cvijic; M. De Claparede.

1. Presentation by the American Ambassador of the Gold Medal of the American Geographical Society to Captain R. F. Scott, C.V.O., R.N.

2. "Recent Exploration and Survey in Seistan." By Colonel Sir Henry McMahon, K.C.I.E., C.S.I.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 173–184. **Penck.**
The Valleys and Lakes of the Alps. By Albrecht Penck.

Baltic—Bornholm and Gothland. *M.G. Ges. München* 1 (1905): 482–484. **Günther.**
Bornholm und Gotland. Von Prof. Dr. S. Günther.

Black Sea. *Monthly Rev.* 22 (1906): 89–108. **Hedin.**
The Black Sea. By S. Hedin.
Jottings concerning the first stage of Dr. Hedin's new journey.

Carpathians. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 138–145. **Martonne.**
Évolution morphologique des Karpathes méridionales. Par E. de Martonne.

Central Europe—Lake of Constance. *M.G. Ges. München* 1 (1905): 488–490. **Kittler.**
Die Entstehungsgeschichte des Bodensees. Von Dr. C. Kittler.

France. *Ann. G.* 14 (1905): 399–423. **Vacher.**
Le haut Cher, sa vallée et son régime. Étude d'hydrographie et d'hydrologie. Par A. Vacher. *With Map and Profiles.*

France—Brittany. *Ann. G.* 14 (1905): 456–459. **Vallaux.**
A propos de la "ceinture dorée." Par C. Vallaux.
Puts forward objections to the views of M. Robert as to the economic contrast between the coasts and interior of Brittany.

France—Economics. **Levasseur.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 840–850.
La répartition des forces productives de l'industrie en France. By E. Levasseur.

France—Shellfish. *B. Musée Océanog. Monaco*, No. 59 (1906): pp. 26. **Joubin.**
Notes préliminaires sur les gisements de mollusques comestibles des côtes de France. Les côtes de la Loire à la Vilaine. Par M. L. Joubin. *With Map and Illustrations.*

France—Vendée. *Rev. G.* 55 (1905): 375–379. **Pawlowski.**
Le Bocage vendéen: la Vendée historique. Par A. Pawlowski. *With Illustrations.*

Germany. *Jahresb. Frankfurter V.G. u. Statistik* 68 and 69 (1903–5): 5–67. **Küster.**
Zur Morphographie und Siedelungskunde des oberen Nahegebietes. Von Dr. H. Küster. *With Maps.*

Germany. *M. Deutsch. u. Öster. Alpenv.* (1906): 6–8, 16–19. **Martin.**
Skifahrten im Riesengebirge. Von Alfred Martin.

Germany. ———
Ergebnisse der Untersuchung der Hochwasserverhältnisse im Deutschen Rheingebiet . . . bearbeitet und herausgegeben von dem Zentralbureau für Meteorologie und Hydrographie im Grossherzogtum Baden. VII. Heft. Das Moselgebiet. Berlin: W. Ernst & Sohn, 1905. Size 14½ × 11, pp. 70 and 68. *Maps and Diagrams. Presented by the Zentralbureau für Meteorologie, etc., Karlsruhe.*

Germany—Coal Trade. **Becker.**
Jahresb. Frankfurter V.G. u. Statistik 68 and 69 (1903–5): 69–118.
Zur Geschichte und Entwicklung des deutschen Steinkohlenhandels. Eine handelsgeographisch-statistische Skizze. Von Dr. A. Becker.

Germany—Rainfall. *Met. Z.* 22 (1905): 496–505, 529–547. **Less.**
Ueber die Wanderung der sommerlichen Regengebiete durch Deutschland. Von Dr. E. Less. *With Diagrams.*

Holland—Place-names. **Beekman.**
Ts. K. Ned. Aard. Genoots. Amsterdam 23 (1906): 1–43.
Nomina-Geographica Neerlandica uit een geographisch oogpunt beschouwd. Door A. A. Beekman. *With Map.*
This instalment (cf. *Journal*, 21, 88, and 23, 531) deals with the element "loo" and its variants.

Italy. *Mém. A. Dijon* **9**, 1903–4 (1905): 293–395. **Chabeuf.**
Tivoli et la villa Hadriana. Par H. Chabeuf.

Italy—Earthquakes. *B.S.G. Italiana* **6** (1905): 1074–1081. **Baratta.**
Calabria Sismica. Nota del M. Baratta. *With Map.*

Italy—Malaria. *B.S.G. Italiana* **6** (1905): 1048–1056. **Roncagli.**
A proposito della "Carta della Malaria." Note e riflessioni del Comandante G. Roncagli.

Norway. *B.S.G. de l'Est* **26** (1905): 223–228. **Collesson.**
Ascension du Tromsdalstind (Norvège). Par P. Collesson.

Norway and Sweden—Watershed. *Norsk Geol. Ts.* **1** (1905): 1–15. **Reusch.**
En eiendommelighed ved Skandinaviens hovedvandskille. Af H. Reusch. Med "English Summary." *With Map.*
On a peculiarity in the nature of the main water-parting of Scandinavia.

Pyrenees. *C. Rd.* **141** (1905): 966–968. **Termier.**
Sur la structure géologique des Pyrénées occidentales. Note de M. Pierre Termier.

Russia. *Material. Geol. Russlands* **22** (1905): 349–370. **Samojlow.**
Vorläufige Mittheilung über eine Reise nach dem Nagolny Gebirge (Donetz-Bassin). Von J. Samojlow. [In Russian.]

Spain—Cantabrian Mts. *C. Rd.* **141** (1905): 920–922. **Termier.**
Sur la structure géologique de la cordillère cantabrique dans la province de Santander. Note de P. Termier.

Turkey. *A travers le Monde* **11** (1905): 377–380. **Armagnac.**
Une Excursion aux Lacs du Rilo sur la Frontière de Macédoine et de Bulgarie. Par J. Armagnac. *Illustrations.*

Turkish Empire—Sects. *Deutsch. Rundschau G.* **28** (1905): 115–120. **Wiese.**
Die orientalischen Kirchen im türkischen Reiche. Von Dr. J. Wiese.

United Kingdom—Ireland. **Pethybridge and Praeger.**
P.R. Irish A., **25**, *Sec. B.* (1905): 124–180.
The Vegetation of the District lying South of Dublin. By G. H. Pethybridge and R. L. Praeger. *With Map and Illustrations.*
Noticed in the Monthly Record for March, p. 297.

United Kingdom—Stonehenge. **Lockyer.**
Nature **71** (1904–5): 297–300, 345–348, 367–368, 392–393, 535–538; **72** (1905): 32–34, 246–248, 270–272.
Notes on Stonehenge. By Sir J. Norman Lockyer. *With Maps, Diagrams, and Illustrations.*

United Kingdom—Woodlands. *J.R. Statistical S.* **68**: (1905): 737–739. ——
Woodland area of Great Britain, 1905.

ASIA.

Burma—Mergui Archipelago. **Fischer.**
Jahresb. Frankfurter V.G. u. Statistik, **68** and **69** (1903–5): 124–126.
Ueber die Selungs im Mergui-Archipel in Südbirma, Sowie über die südlichen Shanstaaten. Von Prof. Dr. A. Fischer.

Central Asia. **Semenov.**
A. A. Semenov. Ethnographical Sketch of the Zarafshan Mountains of Karateghin and Darwaz. [In Russian.] 1903. Size 12 × 9, pp. 112. *Map and Illustrations. Presented by the Author.*

Central Asia—Kuen Lun. **Hongwanji.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 741–751.
Where are the Kuen Lun Mountains? By Kozui Otani Nishi Hongwanji.
Shows that the original Kuen Lun of the Chinese was situated near the sources of the Hwangho.

China—Geology. **Leclère.**
Etude géologique et minière des Provinces chinoises voisines du Tonkin. Par A. Leclère. (Extrait des *Annales des Mines*, livraisons d'Octobre et de Novembre

1901 et de Septembre 1900.) Paris: V^ve Ch. Dunood, 1902. Size 10 × 6½, pp. 220. *Maps and Illustrations.*

China—Kwang-chou-wan. *Rev. G.* **55** (1905): 371–375. **Darlu.**
Notes de Séjour à Quang-Tchéou-Wan. Par Pierre Darlu. *With Illustrations.*

Chinese Empire—Tibet. *M.G. Ges. München* **1** (1905): 496–499. **Filchner.**
Expedition zum Oberlauf des Hwangho in Osttibet. Von Leutnant W. Filchner.

Chinese Empire—Tibet. **Kaminski.**
Rep. Eighth Internat. G. Congress, 1904 (1905) 380–385.
The Climate of Ts'aidam. By A. Kaminski. *With Diagrams.*

Chinese Empire—Tibet. **Kozloff.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 737–740.
The Scientific Results of the Russian Expedition to Kham. By Captain P. Kozloff.

Chinese Turkestan—Kashgar. **Parker.**
Imp. and Asiatic Quarterly Rev. **20** (1905): 328–337.
Kashgar. By E. H. Parker.

Dutch East Indies. *Rep. Eighth Internat. G. Congress* 1904 (1905): 715–723. **Kan.**
Geographical Progress in the Dutch East Indies. By Dr. C. M. Kan.

Eastern Asia—Botany. **Forbes and Hemsley.**
An Enumeration of all the Plants known from China Proper, Formosa, Hainan, Corea, the Luchu Archipelago, and the Island of Hongkong, together with their Distribution and Synonymy. By F. B. Forbes and W. B. Hemsley, F.R.S. (*J. Linnean S. (Botany)* **36** (1903–5): pp. 686.)
The work is completed in this volume.

Eastern Asia—Sakhalin. *Imp. and Asiatic Quarterly Rev.* **20** (1905): 279–285. **Dalton.**
Sakhalin or Karafto. By L. V. Dalton.

Eastern Asia—Sakhalin. *G.Z.* **11** (1905): 701–704. **Korthals.**
Sachalin. Von W. C. Korthals.

Russia—Siberia. **Ducrocq.**
Georges Ducrocq. Du Kremlin au Pacifique. 2^me édn. Paris: H. Champion, 1905. Size 10 × 6½, pp. 148. *Illustrations. Presented by the Publisher.*
Account of a journey across Siberia by the railway and the Amur, the chief attention being devoted to the less-known parts. The illustrations give a good idea of the different types of country.

Russia—Caucasus. *Blackwood's Mag.* **178** (1905): 781–791. **Beresford.**
The Frosty Caucasus. By Colonel C. E. de la Poer Beresford.

Russia—Caucasus. *Material. Geol. Russlands* **22** (1905): 269–290. **Pjatnizky.**
Geologische Untersuchungen im Central-Kaukasus. II. Zwischen den Flüssen Maruch und Baksan. Vorläufige Mittheilung von P. Pjatnizky. [In Russian.] *With Profiles.*

Turkey—Asia Minor. *Z. Ges. E. Berlin* (1905): 412–426. **Philippson.**
Vorläufiger Bericht über die im Sommer 1904 ausgeführte Forschungsreise im westlichen Klein-Asien. Von Prof. Dr. A. Philippson.

AFRICA.

Africa—Exploration. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 701–703. **Gibbons.**
Methods of Exploration in Africa. By Major A. St. Hill Gibbons.

Africa—Geology. **Knox.**
Notes on the Geology of the Continent of Africa. With an Introduction and Bibliography. Compiled in the Department of the General Staff, War Office. By Alexander Knox. London: Wyman & Sons, 1905. Size 9½ × 6, pp. 166. *Map and Profiles. Price* 3*s. Presented.*
Brings together, from scattered sources, practically all the information we possess as to African geology.

Africa—Historical. **Du Caillaud.**
Rep. Eighth Internat. G. Congress, 1904 (1905): 930–938.
Des Chrétiens de Saint Mathieu existant en Afrique au commencement du quator-

zième siècle, et de l'identification à l'Ouganda de l'Empire chrétien de Magdasor. Par F. Romanet du Caillaud.

The author's arguments are hardly convincing.

Africa—Railways. *Smithsonian Rep.*, 1904 (1905): 721–735. **Fock.**

The Economic Conquest of Africa by the Railroads. By A. Fock. *With Maps.*

From the *Revue Générale des Sciences.*

British East Africa. *J.R. Col. I.* 37 (1906): 129–159. **Eliot.**

The Progress and Problems of the East Africa Protectorate. By Sir Charles Eliot, K.C.M.G., etc.

Cape Colony—Kimberley. **Sutton.**

Rep. Eighth Internat. G. Congress, 1904 (1905): 308–321.

The Climate of Kimberley. By J. R. Sutton.

Central Africa. *Mouvement G.* 22 (1905): 625–631. **Lemaire.**

Note sur le lac Di-Lolo. Par Lieut. C. Lemaire.

Central Africa. *Mouvement G.* 22 (1905): 601–605. **Wauters.**

Le Genèse du Kasai supérieur et l'assèchement de l'ancien lac du Lobale. Par A. J. Wauters. *With Map.*

Central Sudan. *M. Deutsch. Schutzgeb.* 18 (1905): 318–347. **Marquardsen.**

Die geographische Erforschung des Tschadsee-Gebietes bis zum Jahre 1905. Von Oberleutnant [H.] Marquardsen. *With Maps and Illustrations.*

Congo State. *Z. Ges. E. Berlin* (1905): 467–471. **Frobenius.**

Leo Frobenius' Forschungsreise in das Kasai-Gebiet. 1. Bericht über den Verlauf der Reisen in das Kuilu-Gebiet vom 18. Februar bis zum 21. Mai 1905. Von L. Frobenius.

See note in *Journal* for December, 1905 (p. 672).

East Africa. *Petermanns M.* 51 (1905): 217–218. **Hahn.**

Aufnahmen in Ostafrika, Begleitworte zur Karte der Galla-Länder, nach den neuesten Forschungen gezeichnet von Carl Schmidt, 1 : 1,500,000. Von Prof. Dr. F. Hahn. *With Map.*

The map embodies the results of all recent journeys in the Galla countries south of 6° 40′ N.

East Africa. *C. Rd.* 141 (1905): 1039–1041. **Rothschild.**

Exploration de l'Afrique orientale. Note de M. de Rothschild.

On the results of a journey for zoological research (see March number, p. 303).

Egypt. **Garstin.**

Report upon the Administration of the Public Works Department in Egypt for 1904. By Sir W. Garstin, G.C.M.G., with Reports by the Officers in charge of the several branches of the Administration. Cairo, 1905. Size 11 × 7½, pp. 410. *Plans and Diagrams.*

French Congo—Chad Territory. **Bruel.**

Renseignements Col., Comité Afrique Française (1905): 357–376, 434–447, 502–509.

Le cercle du Moyen-Logone. Par G. Bruel. *With Map and Illustrations.*

German South-West Africa. *Z. Kolonialpolitik* 7 (1905): 723–726. **Gessert.**

Ueber rentabel Wasserstauung in Deutsch-Südwest-Afrika. Von F. Gessert.

German South-West Africa. *Z. Kolonialpolitik* 7 (1905): 760–763. **Gümpell.**

Die Otavi-Bahn und die Otavi-Minen. Von J. Gümpell.

German South-West Africa. *Z. Kolonialpolitik* 7 (1905): 740–759. **Schultz.**

Die Schafwolle in Hinblick auf die Schaf- und Ziegenzucht in Deutsch-Südwestafrika, ein Beitrag zur Kenntnis unserer Kolonien. Von Dr. Schultz.

Madagascar. *B.S.G. Lille* 44 (1905): 337–346. **Cotta.**

Le Sud de Madagascar, mœurs, coutumes, état d'esprit des indigènes. La dernière révolte. Épisodes. Par A. Cotta. *With Illustrations.*

Morocco. *B. Comité Afrique Française* 15 (1905): 387–396; 16 (1906): 26–31. **Dyé.**

La mission hydrographique du Maroc. Par Lieut. A. H. Dyé. *Illustrations.*

See note in the February number (p. 199).

Morocco. *Renseignements Col., Comité Afrique Française* (1905): 554–556. **Gentil.**
Mission de Segonzac: Les travaux de M. Louis Gentil.
See *Journal*, September, 1905, p. 333.

Nigeria. **Dunstan.**
Northern Nigeria. Report on Cotton, Gum, and other Economic Products. (No. II. of Series.) By Prof. W. Dunstan, LL.D., F.R.S. Colonial Reports, Miscellaneous, No. 31, 1905. Size 10 × 6, pp. 24. *Price* 1½*d.*

Nigeria. *J. African S.* 5 (1905): 43–47. **Merrick.**
Languages in Northern Nigeria. By G. Merrick.

Sahara. **Flye-Sainte-Marie.**
Renseignements Col., Comité Afrique Française (1905): 381–406, 470–484, 533–545.
Dans l'Ouest de la Saoura: une reconnaissance vers Tindouf. Par Capitaine Flye-Sainte-Marie. *With Maps.*
See note in the *Journal* for December, 1905, p. 671.

Sahara. *B. Comité Afrique Française* 15 (1905): 399–401. **Gautier.**
La traversée du Sahara. Par E. F. Gautier. *With Map.*

Sierra Leone. *J.R. Col. I.* 37 (1905): 36–52. **Alldridge.**
Sierra Leone and its Undeveloped Products. By T. J. Alldridge.

South Africa. *Scottish G. Mag.* 21 (1905): 625–636; 22 (1906): 29–38. **Watermeyer.**
Geographical Notes on South Africa South of the Limpopo. By F. S. Watermeyer.
A paper read before the British Association.

Transvaal. *T. South African Philosoph. S.* 16 (1905): 107–109. **Johnson.**
On the discovery of a large number of Implements of Palæolithic type at Vereeniging, Transvaal. By J. P. Johnson. *With Illustration.*

Tunis. *Tour du Monde* 11 (1905): 565–576. **Maumené.**
La Région du Bou Hedma (Sud Tunisien). Par C. Maumené. *Map and Illustrations.*

West Africa. *Renseignements Col., Comité Afrique Française* (1905): 485–491. **Chevalier.**
La situation agricole actuelle de l'Ouest Africain. Par A. Chevalier.

West Africa—Historical. *Z. Kolonialpolitik* 7 (1905): 791–796. **Mayer.**
Die ersten Vorläufer der deutschen Kolonisationsbestrebungen in Afrika. Von Dr. L. Mayer.
Refers to the undertakings of Brandenburg merchants in the seventeenth century.

West Africa—Tsetse Fly. *C. Bd.* 141 (1905): 929–932. **Laveran.**
Contribution à l'étude de la répartition des mouches tsétsé dans l'Ouest africain français et dans l'État indépendant du Congo. Note de M. A. Laveran.

NORTH AMERICA.

Alaska. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 204–230. **Brooks.**
The Geography of Alaska, with an outline of its Geomorphology. By A. H. Brooks. *With Map.*

Alaska. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 758–762. **Cook.**
Results of a Journey around Mount M'Kinley. By F. A. Cook.

Alaska—Ornithology. *Rep. Eighth Internat. G. Congress*, 1904 (1905): 641–646. **Smith.**
Habits and Northern Range of the Resident Birds of Point Barrow. By Middleton Smith.

America—Ethnology. **Castellanos.**
Mem. y Rev. S. Ci. "Antonio Alzate" 22 (1905): 5–77.
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London. **Bartholomew.**

The Survey Series of Touring Maps. London and Environs. Scale 1·: 63,360 or 1 inch to a stat. mile. Edinburgh: John Bartholomew & Co., [1906]. *Price* 2s. *net, mounted on cloth. Presented by the Publisher.*

Extends from Epping to Woking in a north and south direction, and from Eton in the west to Bexley in the east. The map is not orographically coloured, as is the case with most of Bartholomew's series, but shows elevation of land by contours and figures. Wooded land and main roads are shown in green, railways red.

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Map of Afghanistan, based on Survey of India maps. Scale 1 : 2,027,520 or 1 inch to 30 stat. miles. London : Topographical Section, General Staff, War Office, 1905. *Price* 2*s.* 6*d.* *Presented by the Director of Military Operations.*

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Asia Minor. **Kiepert.**

Karte von Kleinasien. Bearbeitet von Dr. Richard Kiepert. Scale 1 : 400,000 or 1 inch to 6·3 stat. miles. Sheet B1. Aivalyk. Berlin : Dietrich Reimer (Ernst Vohsen), [1906]. *Price* 6 *marks each sheet.*

This is a specially interesting sheet historically, including the sites of Thyatira, Pergamos, the islands of Mytylene, Lemnos, and the Dardanelles.

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets (Gold Coast) : 72-C, 72-D. London : Topographical Section, General Staff, War Office, 1905. *Price* 1*s.* 6*d. each sheet. Presented by the Director of Military Operations.*

Algeria. **Service Géographique de l'Armée, Paris.**

Carte topographique de l'Algérie. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Paris : Service géographique de l'Armée, [1906]. *Price* 1.50 *fr. each sheet.*

Tunis. **Service Géographique de l'Armée, Paris.**

Carte de la Tunisie. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets : LII., Bir Sbeikeia ; LV., Bled er Rgueb. Paris : Service Géographique de l'Armée, [1906]. *Price* 1.20 *fr. each sheet.*

AMERICA.

Canada. **Dept. of the Interior, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets : 111, Kamloops, revised to January 4, 1906 ; 315, Edmonton, revised to February 20, 1906. Ottawa : Department of the Interior, Topographical Surveys Branch, 1906. *Presented by the Canadian Department of the Interior.*

Canada. **Dept. of the Interior, Ottawa.**

Standard Topographical Map of Canada. Scale 1 : 500,000 or 1 inch to 7·9 stat. miles. Sheet 27, Rainy River District, Ontario and Keewatin. Ottawa : Department of the Interior. *Presented by James White, Esq., Geographer, Canadian Department of the Interior.*

South America. **Huot.**

Régions des Hauts Plateaux de l'Amérique du Sud (Bolivie, Argentine, Chili, Pérou) parcourues par la Mission Française de G. de Créqui Montfort et E. Sénéchal de la Grange, 1903. Carte dressée par V. Huot d'après les travaux des Membres de la Mission, les Sources originales inédites, et les Documents les plus récents. Scale 1 : 750,000 or 1 inch to 11·8 stat. miles. 6 Sheets. Paris : Ministère de l'Instruction Publique, 1905.

On this map the geographical survey results of the recent French scientific expedition to the high plateau region of Bolivia and adjacent regions of South America have been combined with previously existing cartographical material, including some important original documents. A summary of the excellent work achieved by the expedition appeared in the February number of *La Géographie* for 1904, and a brief note based upon this was given in the *Geographical Journal* for April of the same year. Much of the survey work, specially in the neighbourhood of Lakes Poopo and Titicaca was undertaken by Dr. Neveu-Lemaire, but other members of MM. de Créqui Montfort and de la Grange's expedition have contributed to the mapping of the regions visited.

The map itself has been drawn by M. V. Huot, and is printed in colours. A list of the principal sources of information utilized is given on the map.

AUSTRALIA.

Victoria. **Dept. of Crown Lands and Survey, Melbourne.**

Geodetic Survey of Victoria. Scale 1 : 126,720 or 1 inch to 2 stat. inches. Sheet S, revised to July, 1905. Melbourne : Department of Crown Lands and Survey, 1905. *Price 7s. 6d. each sheet. Presented by the Surveyor-General of Victoria.*

Victoria. **Dept. of Crown Lands and Survey, Melbourne.**

Map of Victoria. Scale 1 : 506,880 or 1 inch to 8 stat. miles. 4 Sheets. Melbourne : Department of Crown Lands and Survey, 1905. *Presented by the Surveyor-General of Victoria.*

A general map of Victoria reduced from Government surveys. It is printed in black only, and the hills are shown by vertical hachures.

GENERAL.

World. **Bartholomew.**

Atlas of the World's Commerce. A new series of maps with descriptive text and diagrams, showing products, imports, exports, commercial conditions, and economic statistics of the countries of the world. Compiled from the latest official returns at the Edinburgh Geographical Institute, and edited by J. G. Bartholomew, F.R.S.E., F.R.G.S. Part i. London : George Newnes, Limited, [1906]. *Price 6d. net, each part. Presented by the Publisher.*

This is the first part of an atlas which promises to be most useful and instructive. Its preparation has necessitated several years of painstaking labour and careful research, the results of which are now to be given in the form of a series of one hundred and seventy-six large pages of coloured plates, containing upwards of a thousand maps and diagrams. These will deal, in a general and graphic way, with all the important commodities of commerce, and illustrate the imports and exports of the various countries, their natural resources, developed and undeveloped, means of communication and transport. The atlas will doubtless be the most complete and extensive of its kind ever published in this country. The present issue consists of three sheets of maps, diagrams, and text, one dealing with wheat, another with coffee, and the third consisting of an alphabetical list and brief "Description of Geographical Distribution of the Principal Commodities of Commerce," by W. A. Taylor, M.A. The atlas is to be issued in twenty-two parts, published fortnightly, and the price of each part is only sixpence, so that it will be within the reach of all students and others interested in the most important matters with which it treats.

World. **St. Martin and Schrader.**

Atlas Universel de Géographie construit d'après les sources originales et les documents les plus récents. . . Ouvrage commencé par M. Vivien de Saint-Martin et continué par F. Schrader. Sheet 27, Iles Britanniques. Paris : Hachette et Cie., [1906]. *Price 2 fr. each sheet. Presented by the Publisher.*

A small-scale general map of the whole of the British Isles, including also Belgium, the Netherlands, and a part of France.

CHARTS.

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for April, 1906. London : Meteorological Office, 1906. *Price 6d. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for March, 1906. Washington : U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot Chart of the North Pacific Ocean for April, 1906. Washington : U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Bombay Presidency. **Varley.**

Twenty-four photographs of the North Kanara District, Bombay Presidency, taken by F. G. Varley, Esq., M.A. *Presented by F. G. Varley, Esq., M.A.*

These photographs have been forwarded in continuation of those previously presented by Mr. Varley, and noticed in the *Geographical Journal* a few months ago.

(1) Karwar creek; (2) Casuarina avenue; (3) "The Cannon's Mouth," Sadashivgad; (4, 10, and 11) Belikeri creek; (5) Kalinadi; (6 and 7) Sadashivgad; (8 and 9) Belikeri; (12) Supari garden; (13) Gardener's house; (14, 15, and 20) Anshi ghat; (16) Supa; (17) Arbail ghat; (18) Cocoanut garden; (19) Camp at Anshi; (21) Castle rock; (22) Pepper vine; (23) Jack fruit; (24) Ploughing.

Canada. **Longstaff.**

Fifty-nine photographs of Canada, taken by F. V. Longstaff, Esq. *Presented by F. V. Longstaff, Esq.*

An interesting set of photographs taken by Mr. F. V. Longstaff during a journey through Canada and British Columbia, from June to September, 1902. Most of the views serve well to illustrate the typical scenery along the line of the Canadian-Pacific Railway.

(1) On Simpson's summit, looking north; (2) On Simpson's summit, looking south; (3 and 4) On Simpson's summit, looking west; (5) On Simpson's summit, looking south-west; (6 and 7) On Simpson's summit, looking north-west; (8) Looking down the Simpson river; (9) The Great Divide; (10) Mount Assiniboine; (11) Mount Rundle; (12) The prairie west of Regina; (13) Looking west from Canadian Pacific railway at Pic river, Lake Superior; (14) A bay on Lake Superior; (15) North shore of Lake Minnewanka; (16) South shore of Lake Minnewanka; (17) Workmen's camp of Canadian-Pacific Railway; (18) Spray river; (19) Looking east from railway depôt, Banff; (20) View north from Mount Edith pass; (21) Mount Cascade; (22) Looking up west slope of Mount Cascade; (23) View from Mount Cascade; (24) Looking down the Bow river from Mount Cascade; (25 and 26) Looking south-west from Mount Cascade; (27) Camp, south of Banff; (28) Mount Rundle from the north-west; (29) View south-west from Chalet, Lake Louise; (30) View west from Chalet; (31) View looking east from under Beehive mount; (32) Mount Aberdeen and Castle Crags; (33) Camp at north end of Simpson summit; (34) Foot of Illecillewaet glacier; (35) Looking west from Mount Abbot; (36) Mount Sir Donald; (37) Asulkan valley and glacier from Mount Abbot; (38) Looking east from Mount Abbot; (39) Mount Temple; (40) H.M.S. *Flora* in Esquimalt harbour; (41) Parliament House, Victoria; (42 and 43) Victoria; (44) The "Imperial Limited" at Field; (45) Niagara river; (46) Pilot boat; (47) Sandy Hook lightship; (48–57) S.S. *Etruria*.

Farõe Islands. **Hepburn.**

Twenty photographs of the Farõe islands, taken during 1904 and 1905 by David Hepburn, Esq. *Presented by David Hepburn, Esq.*

On several previous occasions Mr. Hepburn has been good enough to present copies of photographs taken by him on his holiday tours, and the above form a welcome addition to others of the Farõe islands already received.

(1 and 2) Landing-place, Sand; (3) Lake at Sand; (4) Mountain path near Sand; (5) Lille Dimon; (6) Island of Skuõ; (7) Entrance to cave at Frodebõe; (8) The town of Eide; (9) Whale station "Millumair," Thorsvig; (10) Landing at Kvalvig; (11) Kvalvig village; (12) Kvalvig church; (13) Valley between Kvalvig and Saxen; (14) Travelling inland; (15) Little Hans of Velbestad; (16) Thorshavn's only hay-cart; (17) The Vestrevaag, Thorshavn; (18) The cemetery, Thorshavn; (19) Embryo Vikings, Thorshavn; (20) Boat of emigrant ship *Norge*, wrecked off St. Kilda, which reached Thorshavn with nineteen souls on board.

Pahang. **Hankey.**

Twenty-one photographs of Pahang, Malay Peninsula, taken by Basil H. A. Hankey, Esq. *Presented by Basil H. A. Hankey, Esq.*

An excellent set of platinotypes of river scenery, natives, and native dwellings of Pahang, forming a welcome addition to the Society's collection.

(1) A Rambong tree; (2) My boat on the Sungri Jelai; (3) Midday halt on Sungri Telom; (4) View from Kuala Medang up the Sungri Jelai; (5) Looking up Sungri Telom, above Kuala Medang; (6) View on Sungri Telom, below Kuala Ginting; (7) Three generations of Sakais at Kuala Ginting; (8) Sakai hut at Kuala Ginting; (9) View on Sungri Telom; (10) Looking up the Sungri Telom, below Kuala Mesong; (11) My four rafts descending Sungri Telom; (12) The Residency, Kuala Lipis; (13) The Sungri Jelai at Kuala Lipis; (14) View of the Sungri Tembeling from Kampong Tugusay; (15) View on Sungri Tahan, above Kuala Tahan; (16) View on

Sungri Tembeling; (17) Rapids on Sungri Tembeling above Kuala Sat; (18) "Jerom Rusa," a rocky passage on Sungri Tembeling; (19) View on Sungri Pahang from Kuala Triang; (20 and 21) View on Sungri Pahang from Kuala Pahang Lama.

Tibet. **Bailey.**

One hundred and fourteen photographs taken on the British Mission to Lhasa, by Lieut. F. M. Bailey, 32nd Sikh Pioneers. *Presented by Colonel F. Bailey, R.E.*

As will be seen from the titles, these photographs are of exceptional interest. Generally speaking, they are remarkably good specimens.

(1) Suspension bridge over the Rung Chu; (2) The Tibetan Commissioners arriving at Khamba Jong; (3 and 4) Valley with village and cultivation, south-west of Khamba Jong; (5) The jong of Khamba Jong; (6) The abbot of Tashilhunpo visiting Khamba Jong; (7) Hut on the Kangralama pass; (8) The plain at Khamba Jong; (9) Glacier, passed on the road from Khamba Jong to Tangu; (10) Tangu; (11) Panorama of Kinchen Jau; (12) Lieut. Bailey's camp at Bham Tso; (13 and 14) Views taken while exploring the direct route from Khamba Jong to the Kala Tso; (15) Panorama of Kinchen Jau, Chomiomo, and Gyantsu Na; (16) A Tibetan in the camp at Khamba Jong; (17) The village of Lung-dong, near Khamba Jong; (18–21) Festival at a temple near Khamba Jong; (22) Prayer-flags in the Chumbi valley; (23) Temple in the Chumbi valley; (24 and 25) Monastery, with monks, near Phari; (26 and 27) The Mission escort, crossing the Tang La; (28) Chumalhari mount; (29) Chumalhari as seen from Phari; (30) The 8th Gurkhas at Phari Jong; (31) Phari Jong; (32) Tibetan turning a prayer-wheel; (33) View from the Tang La, looking towards Phari; (34–36) Phari Jong and village; (37) Looking up the Khamba valley; (38) Tibetan carpenter at Phari; (39) Kyang near Tuna; (40) Women weaving at Chugia; (41 and 42) Tibetan family of graziers; (43) Road-making on the Tang La; (44) Kyang on the Tang La; (45) Traders crossing the Tang La; (46) Mount Chumalhari; (47) Glacier and lake on flank of Chumalhari; (48) Tibetan "shop" at Tuna; (49) Conference before the Guru fight; (50) Chorten, near Samanda; (51) On the road to Gyangtse; (52) Chorten, through which the road passes; (53) Mounted infantry calling at a monastery near Gyangtse; (54) The village of Naini; (55) Gyangtse Jong; (56) Mounted infantry crossing the bridge at Gyangtse; (57, 58, and 60) Gyangtse Jong, with part of town; (59) Monastery of Palkhor Choide at Gyangtse; (61) 32nd Pioneers marching in to occupy Gyangtse Jong; (62) Panorama of the monastery of Palkhor Choide, Gyangtse; (63) Golden Temple, Gyangtse; (64) Idols in the Golden Temple; (65–67) Paintings on the walls of the Golden Temple; (68) Gyangtse town and jong; (69) Yaks ploughing at Gyangtse; (70) Tibetan wife of the eldest son of the Raja of Sikkim; (71) Bridge on the Lhasa road; (72) On the road to Lhasa; (73) Snowy range reflected in the Bham Tso; (74) Woman sowing grain at Gyangtse; (75) Panorama of the Lingmathang plain; (76) At the northern end of the Lingmathang plain; (77) Village below the Lingmathang plain; (78) Moon rising behind Chumalhari; (79) Panorama of a convent in the hills about 2 miles from Guru; (80) Tse Chen monastery and jong; (81) Wooded lane on the road to Shigatse; (82) The Yamdok Tso; (83 and 84) Chaksam on the Tsangpo; (85) Embarking on the Tsangpo at Chaksam ferry; (86) Tibetan wooden barge at Chaksam; (87) Bridge over the Tolung stream; (88) The Potala, Lhasa; (89 and 98) Depung monastery; (90) The Potala, western approach; (91) Panorama of Lhasa from Ba-mo-ri; (92) Lhasa city from Ba-mo-ri; (93) The Shapés leaving camp after a visit; (94) Men fishing near Lhasa; (95) The Potala from the north; (96) Half-tame kyang, belonging to the Dalai Lama; (97) The Ta Lama; (99) Chorten forming the gateway of Lhasa city; (100) The Potala from the north-west; (101) Bridge over the Tolung Chu; (102) Troops lining the road to the Potala on Treaty Day; (103) The signing of the treaty within the Potala; (104–106) In the Lhasa bazaar; (107) The Potala from the south-east; (108) Doring in front of the Jokang; (109) The Ling-Kor, or "Via Sacra" of Lhasa; (110 and 111) Theatricals at the Mission House, Lhasa; (112) Four Shapés; (113) The Tongsa Penlop of Bhutan; (114) The Yamdok Tso.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

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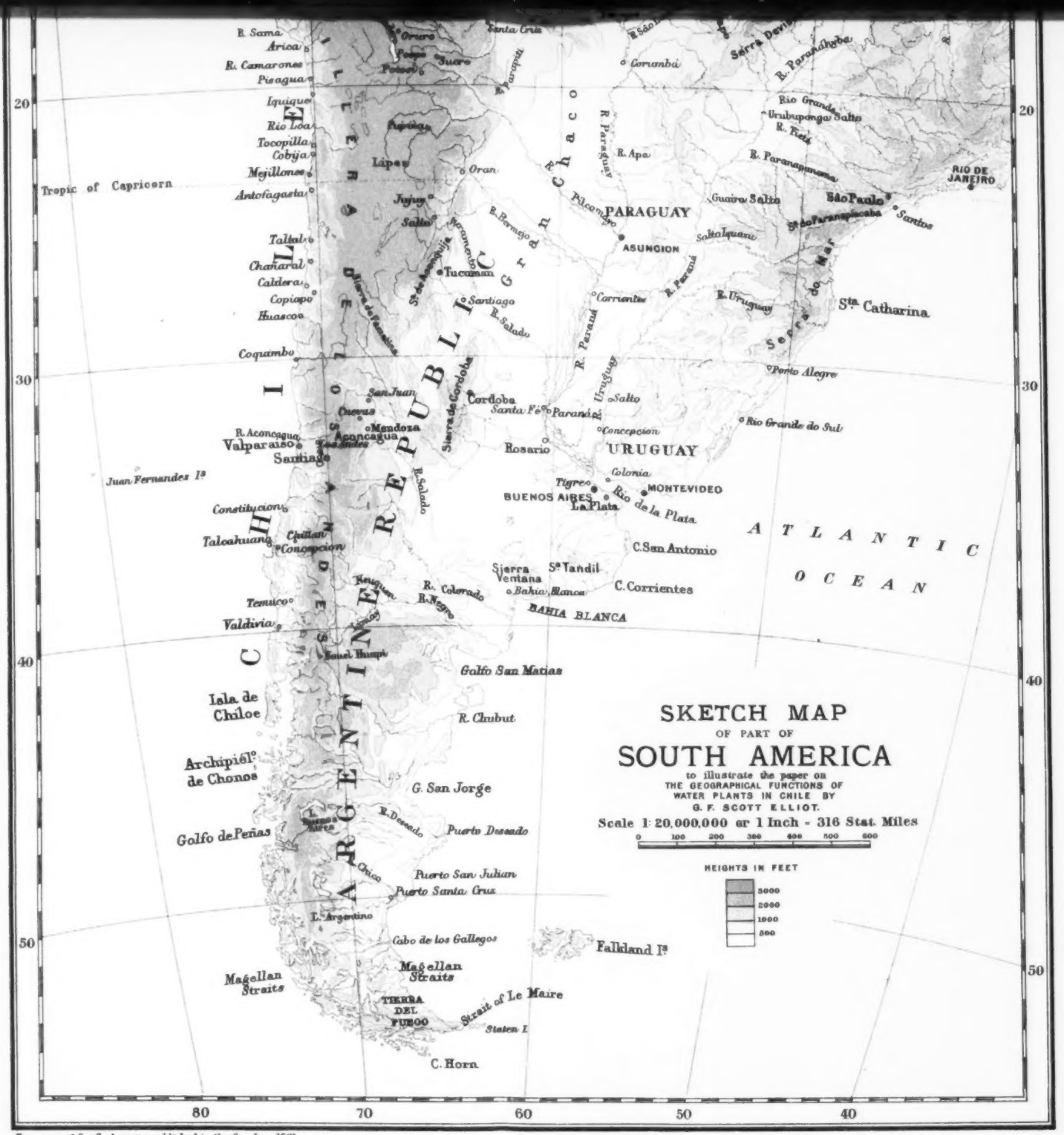
El Callao
LIMA
PERU
Amapi mayu
R. Beni
Manore
Rio Grapore
Serra dos Parecis
R. Juruena
Rio Arinos
São Manoel
BRAZIL
Llanos de Mojos
MATTO GROSSO
Cuyabá
Sa. Vicanota
Plateau de Titicaca
Nudo de Apolobamba
BOLIVIA
LA PAZ
Illimani
Illampu
Nudo de Cochabamba
Lago de Xarayes
R. São Lourenço
Sa. do Cayapo
Sa. dos Pyrenços
Serra Deviposo
Francisco
R. Sama
Arica
Oruro
Santa Cruz
R. Camarones
Pisagua
Potosi
Sucre
R. Parapiti
Corumbá
R. Paranahyba
Iquique
Rio Loa
Tocopilla
Cobija
Mejillones
Tropic of Capricorn
Antofagasta
Lipez
Oran
Jujuy
Salta
R. Pilcomayo
R. Paraguay
Chaco
R. Apa
Rio Grande
Urubupunga Salto
R. Tieté
R. Paranapanema
RIO DE JANEIRO
São Paulo
Guaira Salto
Santos
Sa. do Paranapicaba
PARAGUAY
ASUNCION
Saltaquasu
Taltal
Chanaral
Caldera
Copiapo
Huasco
Coquimbo
Tucuman
Sa. de Aconquija
Aconcagua
Sierra de Famatina
Sierra de Velasco
Sierra de Cordoba
Sa. de Sta. Catharina
Sa. do Mar
Corrientes
R. Parana
R. Uruguay
Sta. Catharina
Porto Alegre
Rio Grande do Sul
San Juan
Cuesta de los Andes
Mendoza
Cordoba
Santa Fé
Paraná
Salto
Concepcion
R. Aconcagua
Valparaiso
Santiago
Rosario
URUGUAY
Juan Fernandez Is.
Tigre
Colonia
MONTEVIDEO
BUENOS AIRES
La Plata
Rio de la Plata
Constitucion
Talcahuano
Concepcion
C. San Antonio
ATLANTIC
OCEAN
Sierra Ventana
Sa. Tandil
C. Corrientes
Temuco
R. Colorado
R. Negro
Bahia Blanca
BAHIA BLANCA
Valdivia
Golfo San Matias
Isla de Chiloe
R. Chubut
Archipiél.o de Chonos
G. San Jorge
Golfo de Peñas
Puerto Deseado
Puerto San Julian
Puerto Santa Cruz
SKETCH MAP
OF PART OF
SOUTH AMERICA
to illustrate the paper on
THE GEOGRAPHICAL FUNCTIONS OF
WATER PLANTS IN CHILE BY
G. F. SCOTT ELLIOT.
Scale 1:20,000,000 or 1 Inch - 316 Stat. Miles
0 100 200 300 400 500 600
HEIGHTS IN FEET
3000
2000



From map of South America published in the Geo. Jour. 1901.

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